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PART I.—ESSAYS, MONOGRAPHS, AND CASES.

Henry Cavendish and the Discovery of the Chemical Constitution of Water; a Lecture, Introductory to the Course on Chemistry, in the National Medical College, Session of 1855–6. By Prof. LEWIS H. STEINER, M.D., &c., &c.

To the student of any particular branch of human knowledge, one of the most interesting subjects is the history of the discovery of its principles, and the various incidents in the lives of those men who have given an impetus to its study. *Here* he can see how many difficulties had been encountered before the very basis of knowledge was attained; how many days and nights of toil were consumed in quarrying from the rough mountain the huge blocks, and in subjecting these to the ponderous blows of heavy hammers, as well as the fine strokes of delicate chisels, so that they could be used in laying the foundations and shaping the corner-stone of the superstructure, which now strikes the eye with its symmetrical form and passing beauty. He will find that each step in the progress of a science has been marked with labor of the most intense kind; that, although the results are striking and seemingly self-evident, they are no more so than the erection of some grand

architectural structure, some noble old cathedral pile, where the architect's idea has been so well carried out in every part, that the spectator is forgetful of the enormous cost, the great expenditure of money, and time, and human labor, required to develope and represent this idea. Every course of stone has been laid with care, and much fatigue has been undergone in placing it so that it shall be able to withstand the weight of those destined to be placed above it. And all depends on the foundation being securely laid, deep below the destructive influences of the frost, and on the solid clay or still more solid rock, so that no ordinary tempest or earthquake shall unsettle those walls which embody the idea that had existed in so much beauty in the architect's mind.

No study can be more instructive than an examination of the difficulties the great men of the past have experienced in their toilsome investigations. We not only learn to appreciate the importance of the latter, but we acquire a knowledge of the causes which impeded their progress, and which we should avoid in conducting similar original investigations for ourselves. Thus profit is not only directly derived in the way of knowledge gained, but indirectly also, since we learn to avoid the shoals and quicksands on which the strong barks of others have nearly been made perfect wrecks.

The history of Chemistry is full of most interesting facts connected with its great discoverers, and it is well for its students to rest awhile from their labors and to peruse these with care, so that they can estimate properly how great is the light under which they now prosecute their studies, and to whom they are indebted for it. It has been thought that some things connected with the history of Cavendish and his discovery of the chemical constitution of water might not be unprofitable or uninteresting.

Henry Cavendish was one of those few men, coming from the wealthy ranks of society, who have not only been Mæcenases to science, but who have expended their time and talents, as well as their money, in its cultivation and advancement. His name and his fortune, his intellect and his life, were freely expended in the cause of science, so that when the great French mathematician, Biot, summed up his character, he felt

that he could truly say, that Cavendish was "*le plus riche de tous les savans et probablement aussi, le plus savant de tous les riches.*"

He was the son of Lord Charles Cavendish, the third son of the second Duke of Devonshire. The family can be traced as far back as 1366, in the reign of Edward III., and it seems to be singularly marked, according to Dr. Wilson,* "for the high moral character which for so many centuries it has maintained."

He was born at Nice, October 10, 1731; entered the University of Cambridge December 18, 1749; and left the same, without graduating, in 1753. Of his early life we know comparatively nothing, partly on account of the neglect of contemporaries to record such incidents, and partly on account of the peculiar retiring habits of the man himself, which prevented him from speaking of his early life or indeed of unfolding his inmost character even to those who knew him best. He became a member of the Royal Society in 1760, and from that time up to the period of his death, in 1810, presented many most valuable papers to this Society. We find him spoken of† as "an excellent mathematician, electrician, astronomer, meteorologist, and geologist, and a chemist equally learned and original. In the fullest sense of the term, a natural philosopher; and had he published during his lifetime all the researches which he completed, his reputation would have been much wider and more varied even than it was." But a natural repugnance to appearing before the public prevented him from doing that thing men are so prone to do—to announce the novelties they have discovered, or even to magnify their importance.

As a man we find nothing in his character to love—a stern, impassive representative of a cultivator of science and nothing else. His biographer describes him‡ as one "who did not love; he did not hate; he did not hope; he did not fear; he did not worship as others do. There was nothing earnest, enthusiastic, heroic, or chivalrous in his nature, and as little

* Life of Cavendish, p. 14.
† Life of Cavendish, p. 19.
‡ Life of Cavendish, p. 185.

was there anything mean, grovelling, or ignoble. * * * * An intellectual head thinking, a pair of wonderfully acute eyes observing, and a pair of very skilful hands experimenting or recording, are all that I realize in reading his memorials. His brain seems to have been but a calculating engine; his eyes inlets of vision, not fountains of tears; his hands instruments of manipulation which never trembled with emotion, or were clasped together in adoration, thanksgiving, or despair; his heart only an anatomical organ, necessary for the circulation of the blood."

It may be fairly asked, why bring such a character forward for examination? Surely it is not desirable that it should be imitated? Are we not created for grander and nobler purposes than to be mere negations in a world where one's social influence is of such immense importance? Is it enough *not* to be a villain, a debauchee, a murderer? Or, rather, is it not our duty to be *something* that shall create an influence for *positive good* on our fellow-men? To this the answer must be made, that the character of Cavendish is not introduced as a subject of admiration, or for imitation, but rather as a warning to all men who cultivate the intellect, that they do not neglect the social portion of their nature. While they are rising higher and higher into those regions where an almost intuitive power is given them of perceiving the secrets of nature, it is necessary to strengthen the links of that chain which binds man to man, and which become brighter and brighter with each deed of love and philanthropic kindness. The character of Cavendish thus may serve as a warning set up in the highway of science, to let men beware of immolating all that is common with their fellow-men on its altar, although the investigations they may prosecute shall eventuate in much general good. Their duties are more extensive, *as men*, and while students of science they must not forget these, else we shall class them as Cavendish was classed, as "a cold, clear intelligence, raying down pure white light, which brightened everything on which it fell, but warmed nothing," just as the cold moon may light the traveller's path across the trackless snows, but not contribute one genial ray of heat which shall envigorate his strength, contribute to his comfort, or help him to withstand the icy blasts that are so furiously beating against him.

A word as to the subjects which claimed attention from Cavendish's clear mind, and the general nature of his contributions towards their full elucidation, and we shall proceed to the special discovery we wish to examine at this time.

The determination of the specific gravity of the earth occupied his attention for a long time. His determination (A. D. 1798) was 5.4; and although many experimenters have repeated *his* experiments and made others with reference to the same subject, this number has not been materially altered, the decimal only having been found incorrect, and the specific gravity now being considered 5.6. He determined the freezing point of mercury as between 39° and 40° Farenheit, by a series of experiments which were performed, (A. D. 1782,) in accordance with his directions, by Governor Hutchins, at Albany Fort, Hudson's Bay. Prior to this, it had been considered by Braun at between 300° and 400° Fahrenheit; and the most singularly discrepant views were entertained as to the exact point. The consideration of many subjects connected with heat is so closely bound up with a proper knowledge of *this* point, that its importance will be at once recognized.

Next we find him making some experiments relative to the exact composition of the air; and although the two main constituents of the air were already known, yet it was left for Cavendish to show, that in any given quantity of air, the maximum of consumption of its oxygen by a burning body was one-fifth, and that the per centage of this gas in common atmospheric air was 20.833. The approximation of this determination to that attained at the present time, by the aid of the delicate balances which our scientific mechanics have furnished us, is most wonderful, and can be only understood when we recollect that it was the result of many hundred analyses of the air made during sixty successive days in the year 1781, by this indefatigable experimenter.

In Pneumatic Chemistry, or the chemistry of the gases, although he is considered the fourth in order of time among the English chemists—the other three being Hales, Black, and Priestly—yet he is entitled, on the score of discovery, to a rank along with the first. Dr. Wilson very truly says, "We have done little more in later times than extend, improve, and,

as we complacently say, *perfect* Cavendish's processes for the analysis of gases, and that we differ from him more in our mode of interpreting certain of the phenomena he witnessed than we do in our methods of investigating elastic fluids." His thorough knowledge of a proper *modus operandi* with the gases made him adopt the securest methods of experimenting, so as to allow of the least possible chance of a failure. Accordingly we find that, despite of the imperfection of apparatus (which was exceedingly imperfect and complicated), despite of the general ignorance of both physical and chemical properties of the gases, despite of the thousand and one difficulties that at all times beset the discoverer's path, the experiments of Cavendish were accomplished with an accuracy that our better knowledge of the subject, and command of more perfect apparatus, scarcely make us capable of excelling. In the school of these experiments, his attention was directed to the rationale for the formation of globules of water whenever the electric spark was passed through a mixture of hydrogen gas and atmospheric air, the result of which was the announcement of the greatest discovery of modern times, that of the exact composition of water—and one on which, in our opinion, the present character of chemical science rests as its true basis—without which the whole of analytical chemistry would be at best but a series of shrewd guessings at the composition of material substances, and synthetic chemistry would be confined to the *accidental* formation of substances, instead of that series of sure results with which we find it now abounding.

I call the announcement of the discovery of the composition of water the initial point in the history of rational chemistry, whether we view it in the departments of analysis or synthesis, in medical chemistry, or chemistry applied to the arts. Prof. Playfair has not gone too far when he stated in his lecture before the Society of Arts, Manufactures, and Commerce, that "the discovery of the composition of water has given to Industry a vitality and an intelligence, the effects of which it would be difficult to exaggerate."

Let us briefly examine the history of this discovery, and then see in what way it has been of so much importance to mankind. In doing this it is not desirable that we should involve

ourselves in the polemic arguments that have been brought forward by the friends of two other great men, who are said to have made the discovery prior to its announcement by Cavendish. Much ill-feeling has been excited by the friends of Watt and Lavoisier on this subject, and no less a person than M. Arago has taken the position that Watt really was the discoverer, and that Cavendish had filched all his knowledge of the composition of water from a letter which Priestly had received from Watt. Without going into an examination of this serious charge, which would involve a tedious enumeration of many circumstances to us of no interest, and which would only lead us to the conclusion arrived at by all impartial English observers, that Cavendish was the prior discoverer, we need only say that the charge of plagiarism is entirely dissonant from the general character of this great man, who seemed under all circumstances equally careless of praise or blame from the world.

Priestly and Warltire found, whenever hydrogen gas and atmospheric air were exploded by the electric spark, that there was a deposition of moisture on the inside of the vessels containing the gaseous mixture. Prior to this, however, Macquer, in 1766, observed that whenever a glass vessel was held over a burning jet of inflammable gas, that moisture was formed inside of the vessel. Warltire explained this by the supposition that the gases contained some water diffused through them, and that this, being condensed, appeared in drops on the sides of the containing vessel. Cavendish found that there was no diminution or increase of weight in the vessel after the explosion, but that a volume of hydrogen twice as large as the oxygen in the air had disappeared, that it had left its gaseous condition, and was converted into water. He performed the experiment on a still larger scale, so that this fluid might be examined, and arrived at the conclusion "that this dew is plain water." The after-course of his experiments was directed to the determination of the quantities of hydrogen and oxygen necessary to form water. He discovered that if one volume of oxygen and two of hydrogen were exploded in any way, the result was the conversion of the whole of the mixed gases into water.

Now, how does this discovery, so disconnected at first sight

from the other facts of chemistry, affect the whole progress of the science? How does the simple fact of the knowledge of the true composition of water bear so important a part in the progress of chemistry as to be considered by any one as the initial point in the history of this branch of study as a science? Might we not have a knowledge of all the other elements, and yet remain under the belief that Aristotle and thousands of his followers held, that water was an elementary substance? Could we not have unfolded the arcana of nature without first having cleared up this point, and considered the bland agent which nature uses in effecting the wonderful works of change as an elementary substance?

To all of these interrogatories, the more we think over the subject, the more impressive and emphatic must be our negative. Nothing could have been done which would not have been involved in all the mystery and obscurity that marked every result of the chemist's labors prior to the year 1781. And this is perfectly apparent, when we reflect over the paltry theory of Stahl, as to combustion, which was at that time leading all the world into a maze of confusion with its queer reasons for the combustion of a body, because it had *a something* called phlogiston in it, which regulated the duration of the combustion by the amount present, and when all of this substance escaped, *then* the body ceased to burn. It was necessary to have some plausible, and not only plausible, but some correct theory of combustion, as well as some account of the composition of water. These were both furnished by Cavendish's experiments.

In order to understand *quantitatively* the composition of bodies, it is necessary to get the combining number of some one elementary substance,—to have that well ascertained, and then we are ready, by the known laws of chemistry, to ascertain the combining numbers of all bodies, with which this particular substance forms combinations. In other words, the *equivalents* or *atomic weights* of all the elements could never be obtained had we not that of one single element to commence with. But it would be impossible to obtain the combining number of an element, without experimenting with it when in a state of combination, and hence it is necessary in order to

obtain these numbers, in which all certainty in quantitive chemistry is founded, that we should have a certain knowledge of the weights with which two elements combine in the formation of some known compound. This could be done in the case of water, after the compound nature was once fully understood. A Dalton could weigh the constituent elements and find that the oxygen always weighed eight times as much as the hydrogen, although the latter was twice as much in bulk. After experiments proved that these numbers, 8 and 1, indicated the only proportions in which these two elements would unite with any other elementary substance, and that each one of the others had also a number peculiar to itself, indicative of its combining proportion. And so, *on this discovery*, we may say, was reared that essential guide to all our chemical labors, the atomic theory.

It was a grand discovery, to find that all the substances in nature were allowed only to combine with each other in fixed and definite proportions, and that thus, instead of an infinitude of compound bodies, produced by an heterogeneous union of the elements, the number was to a certain extent fixed and immutable. The proportions with which they combine together is capable of being expressed in numbers. The chemical constitution of all matter becomes, when viewed in this light, beautifully illustrative of the poetry of science. No longer need we leave our own planet to behold this poetry of science, and, with the astronomer, roam through the wide circuit of the universe, as it, with silent grandeur, acts its epic in the measured numbers which his science reveals with so much accuracy. For though our knowledge of the mighty orbits of planets, and the perturbations which these occasion on each other's movements, impress us strongly with the harmony which pervades all creation and enable us to understand what the ancient philosopher spoke of as the Music of the Spheres; yet is not this harmony confined only to the movements of these great bodies, but permeates every particle of their structure, and beautifully governs the composition of all matter.

The slightest change in the composition of a body is sufficient to alter its nature as an innocuous substance, so that it shall become a deadly poison. Add but one atom of hydrogen

to the atom of water, cause a chemical combination to take place between the two, and instead of a supporter of life, and a substance necessary to the life-giving circulation of plants and animals, we find a poisonous substance of so caustic a nature, that when brought into contact with the tongue it produces at once a powerful burning sensation. Fortunately for all living beings this combination is not readily effected, nor is the compound a very persistent one. Otherwise we should be in danger of being poisoned by the very substance which is now the blandest in nature. How well does this fit us to understand the beautiful remarks of Farraday, as to the effects of a knowledge of these facts on the contemplative philosopher? "When I consider," says this distinguished savan, "the multitude of associated forces which are diffused through nature—when I think of that calm and tranquil balancing of their energies which enables elements, most powerful in themselves, most destructive to the world's creatures and economy, to dwell associated together and be made subservient to the wants of creation—I rise from the contemplation more than ever impressed with the wisdom, the beneficence, and grandeur, beyond our language to express, of the Great Disposer of all."*

What an argument against the existence of blind chance is this exact proportion in which elements will alone unite with each other! How consummate a wisdom is thus shown in the formation of the smallest atom of water, which, wherever found, exhibits the same composition. The comtemplative chemist finds himself overcome when he sees the wonderful wisdom, that not only knows the fall of the sparrows to the ground, but has assigned eternal laws to the structure of every atom of that ground itself.

I have assumed here that the full knowledge of the composition of water led to the discovery and announcement of the atomic theory. It was not the special substance under examination by Dalton when the theory suggested itself to his mind; for that was the composition of the compounds of nitrogen and oxygen. But these could not have been understood unless Cavendish had prepared the way for it by first explain-

* Farraday's Lectures, p. 191.

ing the composition of water. It is proper that this explanation should be made lest a charge of innaccuracy be brought with reference to our statements. The atomic theory was the indirect result of this great discovery of Cavendish.

But we have said the discovery of the composition of water was an initial point in the history of rational chemistry. What has been done by this science in the last seventy years? The answer to this question will show the importance of the discovery. In framing such an answer, the difficulty is to know where to commence, since chemistry has intertwined itself so much with the progress of every science, that its benefits are hardly to be appreciated by us unless we closely examine the history of the past, and after having obtained a full knowledge of the comparative ignorance of those days, then look around us and see the blessings which science has showered on us in the present.

Every art has been supplied with a knowledge of all the substances that enter into the composition of the materials it employs, or the tools necessary for their proper working. The perfection of processes, which were formerly dependent entirely on the chance combination of proper quantities of the materials employed, is now so great that empiricism has ceased its rule in the mechanic arts, and the chemist's discoveries constitute the bases on which these are constructed with their huge proportions and wonderful adaptation to the wants of man.

The materia medica is being gradually explained, and its potent extracts, obtained through the aid of pharmaceutic chemistry, are now employed by the scientific physician to the alleviation or cure of disease. He finds himself no longer confined to a mere empirical exhibition of enormous qunatities of drugs, but more elegantly and efficaciously uses their proximate principles, while he rejects their inert constituents. But more than this yet, many of the recondite processes of the living body have been determined to be purely chemical, although regulated by the vital force, and hence he learns to produce such modifications in them as are required when disease has forced them to assume an abnormal form. Much thus of philosophic, rational medicine owes its origin to these

improvements of chemistry. The physician of the present day who neglects its teachings, gropes along his path with a blindness that is as pitiable as it is unjustifiable. He blindfolds his eyes to keep out the glorious sun-light of science, which is shedding a dazzling radiance over the pathway of his brethren; he wanders along alleys and bye-ways, when the straight and broad highway could bring him at once to a terminus of all his labors; he prefers darkness to light, and by some peculiar mental obliquity is prevented from adopting the direct path, but works along in the circuitous meanderings of that curse to all success—*Routine!* He has joined himself to the ignorance of the past, and rejected the knowledge of the present, and an inward turning of all thoughts on the past, has made him "the man behind the age"—a species of skeleton in the social circle of his profession, from whose bones and worm-eaten ligaments his brethren can demonstrate to their students what was the structure of medicine before the spirit of science entered it, and made dry bones to move, clothed them with muscle and cellular tissues and skin, caused artery, vein, and nerve to ramify around them, and infused the breath of active, thoughtful life.

Analytical Chemistry has revealed to us the quantities of the various elements which enter into the formation of the inorganic kingdom, and also of many portions of the organic kingdom, and has enabled the chemist, by synthesis, to form inorganic compounds, far exceeding in number and variety those found in nature, and of varied uses to mankind. Indeed, it has enabled him to use the various agencies of nature in so many novel ways, that new branches of art have sprung up all over the world, which have given thousands of artisans constant and profitable employment. Chemistry has become a science of most certain vitality, and gifted with the power of imparting its vitality to every branch of human industry with which it has anything at all to do. The artisan must feel its importance, and he desires his children, male and female, to have a knowledge of its principles, so that they can avail themselves of the discoveries of the day as they appear, and have an intelligent appreciation of their bearing on what has been done in the past, or may be expected to be done in the

future. Hence it is one of the branches of study which occupies a prominent place in any well-digested system of education, bearing with it the interest which always is attached to the study of anything that directly concerns man as man, and which is capable of illustration in an experimental way. Popular lectures on the subject are devised to meet the want with those who had not the means of studying the subject in their school-days, and the crowds of ladies and gentlemen attending these lectures attest the general interest of the community in a subject so manifestly important as chemistry.

Surely all this, if it has had its origin in the impetus given to the study of chemistry by Cavendish's discovery, must surround the latter with so much importance that no excuse need be given for the introduction of the name and character of Henry Cavendish to the present audience.

But we have not done with Cavendish as a chemist. We must not forget that his right to the discovery of hydrogen gas, as a *distinct* element, is undisputed, even by his enemies, although they have endeavored to rob him of the priority of the discovery of the composition of water. This gas was known prior to his day, and Thomson considers its combustibility as known at the beginning of the eighteenth century.

Cavendish, in the commencement of his observations, labored under the disadvantages which clung to a student of the Phlogiston theory. He found that an inflammable gas was freely discharged whenever iron, zinc, or tin were brought into contact with dilute sulphuric or muriatic acids, and quaintly says: "Their phlogiston flies off without having its nature changed by the acid, and forms the inflammable air."* He imagined thus, at first, that the heating principle of bodies was this phlogiston, which was supposed to fly off during the phenomena of heat and light, and that when metals were plunged in either of these dilute acids, it escaped in the form of an æriform body, which he called inflammable air. Afterwards, however, he advanced the idea that inflammable air was a combination of the mysterious phlogiston and water. Its different properties were carefully examined—the circumstances under which it would burn, and how much atmospheric air must be present, in order

* Wilson's Life of Cavendish, p. 197.

to allow of perfect and entire combustion of the gas were carefully noted. Not being satisfied with this, he advanced to the discovery already noticed, and finding it a constant constituent of water, arrived at the conclusion that the gas given off, whenever the metals mentioned were brought into contact with dilute acids, was furnished from the water with which these acids were diluted. His views as to the real nature of the gas, divested of the foolish nomenclature of the Phlogiston School, show that he had a clear idea of its nature and properties.

During his examination of the gas, his attention was directed to its weight, and he made, according to his biographer, "the first *successful* attempt to compare the density of a gas with that of common air." The attempt had been made previously by Hawksbee and Greenwood, as well as Hales. Their attempts failed for various reasons. It was left, however, for the mind of Cavendish, which was essentially mathematical, to devise such processes and apparatus as would enable him to experiment without any fear of failure. Quantitative examinations were those alone which satisfied his mind, and to the test of weight and measure he endeavored to bring every subject which he examined, not being content until some satisfactory answer was obtained from this test. Hence he was the first who found out that the different gases have, for equal bulks, dissimilar weights. His estimate of the specific gravity of hydrogen was found entirely too large, as he made it about one-eleventh of atmospheric air, whereas the latter is about 14.4 times heavier than it. Such a near approximation, taken into consideration with the necessary imperfection of apparatus at that day, and the probable imperfect removal of atmospheric air from the vessel into which the hydrogen was admitted, must entitle our chemist to the greatest praise for his accuracy, instead of blame for a want of accuracy.

The next subject we find him examining with his usual care and patience was carbonic acid, or fixed air as it was then called. It would be difficult to say who was first acquainted with this acid gas. Paracelsus seems to have known some of its properties, though its name of fixed air was given by Dr. Black, who examined it prior to the date of Cavendish's ex-

periments. Black seems, however, never to have published any account of its properties in general. In 1766, Cavendish took up the subject, and prepared the gas for examination by the action of chlorhydric acid on marble, a method still adopted by the venders of carbonic acid water as the most economical and convenient. His researches resulted in the acquisition of a full knowledge of all its properties, even gettihg the specific gravity very nearly correct.

We must recollect that experiments could not be carried on then as now, with the aid of numerous laboratory appliances, such as glassware of an infinite variety of forms, the multifarious uses of illuminating gas for heating purposes, and the convenient purposes to which caoutchouc is applicable. The modern chemist is supplied with a vast deal to assist him in his researches which the chemist of even fifty years since was not able to command. Consequently, even approximate accuracy in the latter merits much higher praise than perfect accuracy in the former. Continued demand for scientific apparatus has stimulated the mechanic to contrive various means for meeting the chemist's wants, and this he has succeeded in doing so well. that every day affords some fresh evidence of his skill, and the useful assistance he can render to the chemist.

While Cavendish was performing his experiments with reference to the composition of water, by passing an electric spark through a mixture of hydrogen and atmospheric air, he came across a singular result, which had been altogether unexpected. The water produced by the explosion was found possessed of acid properties. This was proven by its converting the blue color of litmus into a red, and by its combining with lime and forming a salt. It was nitric acid. Whence could it have been derived? He followed this query with great care to its ultimate bearings, and soon saw that the electric spark produced an union of the two gases, nitrogen and oxygen, in the proper proportions to form this acid. The fact has been proven in a number of ways since Cavendish's day. Farraday* " has shown that if a piece of paper dipped in a solution of caustic potash be stretched a little below and between two brass balls, from one of which electric sparks are passing to the other, the

* Life of Cavendish, p. 261.

alkali will be rapidly converted into nitrate of potassa, and the paper become touch-paper."

This discovery was probably one of the greatest contributions he made to the cause of science, and it proceeded as a necessary consequence from the experiments with reference to the constitution of water. We have here a clear explanation of the appearance of nitric acid, to a greater or less extent, in all rain water. The passage of the electric current in every thunder-storm repeats, on a large scale, this experiment of Cavendish, and produces a small quantity of nitric acid. This however, only takes place directly along the track of the lightning; and hence but a small quantity of this poisonous acid is formed in the atmosphere, is absorbed by the rains and descends to the soil. But the electric flash does not only, as Cavendish thought, cause the union of the nitrogen and oxygen so as to form nitric acid, but if hydrogen be present also, it causes an union of the nitrogen with it also, and the consequence is the formation of ammonia, which neutralizes a large quantity of the nitric acid, and descends in the rains to invigorate the exhausted soil as nitrate of ammonia. It is not always easy to account for the appearance of this substance in the soil, unless we had been prepared by these views of Cavendish, to account for its formation in the atmosphere, and after transference by the rains to the soil. Nitric acid does not form a constituent of any rock which is widely distributed over the surface of the globe, and yet the nitrates are found always in fertile soils, and in some tropical climes, where there are frequent storms, the quantity becomes so notable that thick incrustations are found on the surface. This acid in the nitrate seems to have considerable effect on the growth of plants, and to be indeed a most indispensable constituent of good soil. Its presence in the soil, as conveyed to it from the atmosphere, is beautifully explained by the aid of this discovery of Cavendish. Prof. Johnston* remarks, on the subject of the formation of nitric acid: "After a thunder-storm plants appear wonderfully refreshed; in thundery weather they grow most luxuriantly, and other things being equal, those seasons in which there is much thunder are observed to be most fruitful.

* Johnston's Lectures on Agricultural Chemistry, p. 160.

Some have ascribed these results to the *immediate* agency of electricity on the growth of plants. Is it not equally possible that they may be connected with this necessary production of nitric acid." The Professor then goes on to state that this acid is difficult to detect in minute quantities; yet "how much must be formed in a thunder-storm, even in our climate (Great Britain), to make the presence of this acid *always* appreciable in the rain that falls—how vast a quantity in those warmer climates where such storms are so frequent and so appalling." Thus the agricultural profession has been supplied with a capital explanation of a most important subject, and the import of Cavendish's discovery is much more than he could have dreamed of. The importance of this discovery is still greater when we view it in its direct bearing on the question of the combustibility or not of nitrogen.

Cavendish's formation of nitric acid out of nitrogen, in the way just mentioned, proved conclusively that this gas could be oxidated under certain circumstances, or that it could be subject to combustion, using the latter term in its widest chemical signification. This has been seized hold of by Liebig and Johnston, and made also to subserve the purposes of agricultural chemistry, in the way of accounting for the immense quantity of nitric acid contained in some soils, far beyond that which could possibly be formed from the action of electricity on the atmosphere. Whenever organic matter containing nitrogen undergoes the processes of decay or putrefaction, ammonia is formed from the hydrogen of the water present, and this nitrogen. But this ammonia is rarely found present in very large quantities, although large quantities of nitric acid are readily recognized, and mostly in connection with alkaline bases, making nitrates. In fact, the presence of these alkaline bases determine the metamorphosis of the ammonia into nitric acid, through the combustion or oxidation of its nitrogen. The alkaline bases induce, so to speak, "this oxidation, by the tendency of these substances to combine with the acid which is formed by this union of the elements of which nitric acid consists." *

This explanation of Liebig, based on Cavendish's discovery,

* Johnston's Agricultural Chemistry, p. 163.

beautifully illustrates the immense importance any discovery in science may be to *present* and *after* investigations, and also how little able a discoverer is to realize the importance of the fact he has attained after long and toilsome research. Truth is indeed of such a nature that its value stops not at one point, but by inosculations many and various, extends its aid to all branches of knowledge, and binds them together by a common bond, so that what is useful to one branch will be seen alike important and useful to all, and *catholic* in all its peculiarities.

When we sum up the peculiarities of Cavendish as a chemist, we find them to be as follows: A mind perfectly free from all foregone conclusions, and hence specially suited to carry out new lines of investigation, and to interpret properly the meaning and bearing of the results therein attained. This is by no means one of the least important peculiarities of mind required by the experimenter. How many ridiculous estimates have been made of the results of experiments, merely because the glasses through which the experimenter viewed them, had been previously so colored that their true form and nature could not be clearly recognized? Thus monstrous theories have been warmly maintained because their authors have determined that such and such results should be produced by their experiments. The real nature of the results has been overlooked, and men have been led astray by their false interpretation, until some mind, unprejudiced by theories of its own, has examined them carefully, and has sifted them from all irrelevant matters, and arrived at the simple truth. The history of chemistry, past and present, is teeming with illustrations of this kind, and many really important discoveries have been overlooked while some apparent confirmation of an unsubstantial theory has been seized as pure gold by the blinded experimenter. Indeed, it is one of the most difficult of all things, to elaborate a course of experiments, with a mind perfectly freed from all disposition to give a certain complexion to the result, and to truly interpret only so much as is really presented by it. Too often the result is but used as a mirror, in which the chemist only sees his own darling idea reflected, without paying any attention to the real nature of that mirror, or to the obli-

quity of his vision, which is but viewing a projection forth of his own ideas in all their unsubstantiality, rather than the truth involved in the material form before it. Such was not the habit of Cavendish. Mistakes were frequently made as to the results of experiments, never on account of any peculiar theory to which he was determined, to bind them as illustrations, but on account of the slight knowledge which the world possessed of chemistry, and therefore its inability to recognize, at first sight, the full meaning of its facts. But repetition of his experiments enabled him to see errors, and to place himself right as to his conclusions. On this account he never published a paper on any subject until he examined his own views with the sternest critic's eye, and forced them to undergo the severest tests. There was no disposition to enter a *caveat* against any one's poaching on his grounds—no use of the meetings of scientific societies or the pages of scientific journals for the publication of ill-digested opinions on novel results of experiments. But all his published manuscripts show that they have been carefully digested—his opinions freed from all irrelevant matter, and tried and approved by, or rather based on experiment. The author of "Pursuit of Knowledge under Difficulties," says that "he never advanced anything in any of his papers which he had afterwards to retract."

It is evident also that, in addition to a mind free from any bias in the examination of his experiments, he was a careful manipulator. His apparatus was of the simplest character. He took no delight in complications of apparatus, which only impress the eye with their complexity and weary the operator. His mechanical skill as a deviser of new forms of apparatus was exceedingly small, but he had the still happier facility of adapting the old forms to his own purposes and making them available. Hence all the apparatus which has descended to our time from the laboratory of Cavendish is marked with great simplicity and even want of finish.

Another peculiarity of Cavendish as a chemist, and which has already been incidentally alluded to, was his fondness for quantitative determinations of all substances which he examined, and the accuracy of those determinations. This must have been the result of a mathematical turn of mind, which he

derived from his father, Lord Charles Cavendish, who was an excellent mathematician, "who had devoted himself to meteorology, and had paid special attention to the improvement of the thermometer and barometer, so that our philosopher was easily trained to the points essential to the accurate construction and employment of these instruments." This mathematical turn of mind caused him to combine the study of physics with that of chemistry, and the subject of electricity and the aurora borealis were well treated of by him. But its greatest influence was in the determination of accurate quantities in his examinations. The quantitative analysis of the air compares well with those since made with the best laboratory appliances. The specific gravity of carbonic acid gas, as determined by him, has already been shown to be approximately correct, and this is true of every quantitative determination.

If mathematical accuracy, great care and simplicity, and an unprejudiced mind, are essentials in the composition of the chemist, surely we have them here, combined in a most wonderful manner in the case of Cavendish. We are now led to see how these, with his remarkably original turn of mind and powerful intellect, enabled him to tower above his scientific compeers—to write his name high up among the benefactors of mankind, and to have a reputation as a scientific man which it must ever be the jealous care of his brethren to maintain with its original brilliance.

A few words on his character as a man and the cause of his peculiarities, and our task is done.

One of the most remarkable traits in the character of Cavendish was his extreme diffidence and indifference to society of all kinds. He was scarcely ever found in society, and never willingly entered into conversation with the opposite sex. This was carried to so great an extent that he never communicated orders to his female servants directly, but by means of a note directed to his housekeeper. An anecdote quoted by his biographer, Dr. Wilson, from Tomlinson, illustrates this perfect misogyny in the most amusing way. "One evening," says Tomlinson, "we observed a pretty girl looking out from an upper window on the opposite side of the street, watching the philosophers (the members of the Royal Society Club) at din-

ner. She attracted notice, and one by one we got up and mustered round the window to admire the fair one. Cavendish, who thought we were looking at the moon, bustled up to us in his odd way, and when he saw the real object of our study, turned away with intense disgust, and grunted out 'Pshaw!'" Dr. Wilson suggests as the origin of all this want of sympathy, that he lost his mother in early life, and that he was brought up away from the genial and humanizing influences of home. The explanation is exceedingly probable, for we cannot conceive how any one who has learned to appreciate the kind care of a mother, to prize those genial effects her sweetness of character and gentle disposition have produced in his own, to adore the purity of thought and feeling that so sweetly marks her life, without feeling the highest respect for the sex, whose gentleness is so much more powerful than our strength, that the stout man is often caused to bend the knee before it, and feel his own real moral weakness from the contrast. The man that has loved a mother can never have a low appreciation of the sex, if it were only for her sake.

But with all Cavendish's retiring habits he was exceedingly liberal, not knowing exactly how much he *should* give when solicited for a benevolent object, but always giving as much as any name on the subscription list. An anecdote of his liberality is given by Cuvier. A young man had broken a very valuable piece of apparatus, and the keeper of his apparatus came to tell him of it—the only answer he received was, "it is necessary for young men to break instruments, in order that they may learn how to use them—have another one made."

Routine marked his daily habits, which were the same for the greater portion of his life. The same style of clothing, the same place for his household affairs, even the same bill of fare for his dinner—truly has he been styled "a piece of intellectual clock-work"—that was not intended to produce any effect on mankind in any other department than that of pure knowledge. He has gone to his grave—one of the most distinguished of the benefactors of science—unwept, although honored.

It was thought that an examination of this great man's character, and his most important discovery would be useful,

at the opening of our course on chemistry, since his name must be occasionally mentioned, and the sources from which information with reference to his life is to be gained, are but few. Large draughts of material have been made from the very fair and impartial account of his life by Dr. George Wilson, which is accessible to but few in this country.

It is pleasant to treasure up the little incidents connected with the history of great discoveries, and the lives of their authors. If the latter, in a social respect, does not inspire us with as much love and regard, as would a close examination of the life of one more peculiarly belonging to this country, that of Sir Humphrey Davy; yet, we can profit by it, if we only learn to avoid the blemishes in our own character, which were so prominent in that of Cavendish.

Gentlemen, our science is connected with so many departments of research, that it demands the attention of every man, but most especially that of those who propose to themselves to adopt the profession of medicine as their calling, or rather those who feel themselves *specially called* to its study, for none others should enter the ranks of medicine. If the example of Cavendish stimulate you to the cultivation of chemistry with methodical accuracy and care, your results, if not so striking and imposing as his, yet I am bold to say, will be important in fitting you for your noble calling. The moral heroism of our profession, as exhibited from time immemorial, during the visitation of destructive scourges, and most especially within the season just past, is sufficiently great to demand the admiration of a gazing world. May you all be ready to exhibit the same unflinching attention to duty, having previously prepared yourself by honest and laborious study to accomplish such duty! May the results of all your *studies and labors*, in the various branches of the professional preparation, fit you to become, not only great men, but what is much better, good men, useful physicians, each a hero in his sphere.

European Practitioners.—No. II.

MR. FERGUSSON, SURGEON EXTRAORDINARY TO H. R. H. PRINCE ALBERT.

In our last we gave a brief sketch of her Brittanic Majesty's principal surgeon *in esse;* at present we shall furnish one of his probable successor. Some of our readers may possibly inquire, "Who is Mr. Fergusson?" and "Of what interest is Prince Albert and his 'surgeon-extraordinary' to us?" But Prince Albert, we take leave to inform them, is the gentleman who, as prince consort, at present rules England, and Mr. Wm. Fergusson is the individual who will one day make his appearance as Sir William Fergusson, Bart., Sergeant-Surgeon to the Queen, so soon as Sir Benjamin Brodie has shuffled off the mortal coil.

Mr. Fergusson is, moreover, on the whole, an estimable member of the medical profession, and he is a distinguished surgeon too. Barring an inordinate attachment to rank, which is, perhaps, inseparable from the position of a medical man in England unless he be wholly insensible to his interest, he has no conspicuous fault. He has not the mercenary, shop-keeping disposition of Cooper; he is superior to the hollow diplomatic trickery of Brodie; he possesses much of Liston's dexterity as an operator, without any of his coarseness; he is an able medical practitioner, as well as a good surgeon; and, therefore, as one of the future heads of the Medical Faculty in England, he is worthy of Transatlantic attention.

Mr. Fergusson was not originally destined for the profession of surgery. He was the son of a humble member of the Scotch Customs, or Excise Office, and was designed originally for the law. Some of his associates, in an aristocratic country like England, sneer at him for the humility of his birth; but this in reality only the more entitles him to our regard. At law he never acquired distinction, and in all probability never would. Though shrewd, and a man of the world in his address, he has a hesitating, prosaic manner of expressing himself in public, which would have prevented him from ever acquiring eminence at the bar, if his ambition had soared superior to the

level of an Edinburgh solicitor or attorney. He therefore acted wisely when, in the eighteenth or nineteenth year of his age, he abandoned the position of clerk in a Scottish lawyer's office, and enrolled himself as a student of medicine.

The Edinburgh Medical School at this period had attained a splendour and enjoyed a reputation such as its past annals had not seen, and its future will not see. The University of the city was not distinguished, though Monroe—*Tertius* or *Quartus* as he called himself, in consequence of being the third or fourth member of a family of hereditary drones who had held the office—was an able Professor of Anatomy, notwithstanding his insufferable laziness, and the prosiness with which he would bore his audience about his "father's catheter," his "grandfather's catheter," and his "own catheter," as he held up for their edification a specimen of the instrument. Hope, too, was an able manipulist in chemistry, though with the exception of strontium—a discovery suggested by the potassium and sodium of Davy—he never made any great original invention, or propagated a single remarkable thought. The two Duncans, father and son, were amiable men, though at the best laborious dunces, who owed their offices solely to the merits of civic influence or self-election; and Alison is one whose intolerable heaviness still survives. But it was for its School of Private Lectures, or free lancers, that Edinburgh then was eminent; and it rejoiced in a *corps* which, as we have already said, its past annals had not witnessed, and its future can scarcely hope to see.

It would be idle for us even to attempt an enumeration of them now. Old John Barclay, one of the greatest anatomists who ever lived, had just disappeared from the scene. John was originally brought up for the pulpit; but his tongue having either stuck fast to the roof of his mouth, or he being afraid that it would do so, on his first appearance there, he resolved to devote himself in future, as he said, "to the body instead of the soul," and he assuredly produced some works on anatomy, on life and organization, which—barring in some respects his useful, though, in others, harsh and far-fetched system of nomenclature—science will not readily let die. Turner, however, still was there to enlighten it by his elegant researches and discourses upon chemistry, before his removal to the College of

Stinkomalee or University of London. Lizar gave it the benefit of his anatomical knowledge, which really was great, though he was invariably distinguished for a species of innocent charlatancy or *niaiserie*, and Mackintosh enlightened by the profundity of his lectures upon the subject of women and children, though the gravity of his discourses was often strangely marred by the introduction of a sort of wit or humor, the oddest on record. Liston, too, was then a private lecturer in the Edinburgh School, and though savage as a brute, and coarse as a butcher, it is impossible to deny him the merit of great Titanic force. His abilities as an operator were as undoubted as his vices and his grossness as a man. It were as futile to deny his great inherent power in the one capacity, as to question his grovelling, selfish, and utterly faithless disposition in the other.

But a still more noted character, perhaps, than any of them, was Dr. Robert Knox, with whom Mr. Fergusson entered as a pupil, and of whom he shortly afterwards became the principal assistant. Knox was one of those extraordinary individuals, who look as if they never had been young, and seem as if they never would be old. Small-pox had ravaged his face frightfully in his youth, and left him but one eye—though that eye was a piercer, and he could, in most instances, see as far with it as can ordinary mortals with two. Though in many respects shrewd, however, he was in others strangely destitute of judgment, and, in all, utterly divested of moral feeling. The ugliest and most absurdly comical-looking man in existence, he was also one of the most dangerous. From lips thick as a whale's or a codfish's, and a mouth reaching from ear to ear, he would pour forth the most dulcet and entertaining strains. He was one of the first who rendered anatomical lectures agreeable, and in the rare cases in which he obtained admission into private society, he was equally fascinating. There was utter baseness, however, and hollowness in it all. If invited to your table, he would immediately set to work to seduce your wife, or your daughter, or your sister, or your maid servant; and, strange to say, though one of the most repulsive and ludicrous dwarfs in existence, he had a tongue so silvery that he generally succeeded. Could you have got rid of his ludicrous

visage, he would have equally hoodwinked yourself; and the most extraordinary part of the whole was, that he was so utterly destitute of moral feeling as to see no impropriety whatever in the matter. He bartered his own sister just as readily as he would have debauched yours, and he stared upon you as a fool if you hinted there was aught unusual in the arrangement.

It was Fergusson's misfortune in early life to become connected with this man, and their connection affords the only ground for the slightest imputation on Mr. Fergusson's fame. We should willingly pass lightly over this matter, but it is wholly impossible to ignore it. The impediments thrown in the way of dissection were so great, and the price of dead bodies in the winters of 1829–30 in Scotland became so high, that living men were sacrificed for the sake of the sums which their corpses would bring. All the anatomical lectures of Edinburgh were destitute of subjects; but Knox's room was abundantly supplied, and hence he had not only an enormous number of students, but he had the folly besides to inform them that, so long as they came to him, they should invariably be provided. Inquiry was instituted, and it was ascertained that twenty or thirty poor people had been taken from the streets and murdered just as the wants of the dissecting-room required. A fierce outcry arose, and Knox, with his assistants, was loudly inculpated. That Knox himself was privy to the whole affair we entertain not the slightest doubt. With his usual moral imperception he even asked: "What is the use of these brutes if not to contribute to the advancement of science?" and as his sister had long maintained a *liaison* somewhat more than platonic with the Lord Advocate or public prosecutor of Scotland, he successfully employed her influence with that official to keep his own name out of that indictment which deservedly brought two others to the gibbet. But that Fergusson and the other assistant (Jones) was privy to it, we do not in the slightest degree believe. Fergusson is, perhaps, too much disposed, when his own interests are concerned, to connive at the misconduct of "the powers that be," and the other is a stupid creature, who, though the author of a tolerable work on the eye, devoutly believes in witchcraft. We should have suspected Jones infi-

nitely more than the junior assistant; but really, so far as can be ascertained, no blame attaches to either.

They both, however, found it expedient soon to terminate their connection with Knox. Jones went abroad to Germany, whence he did not return for a number of years, and Mr. Fergusson established himself as a lecturer on surgery in the city of Edinburgh. Knox, meanwhile, became so wild and outrageous in his remarks, that he utterly lost his position as a teacher. Of all topics in the world he had the folly and the indecorum to choose that of the Virgin Mary for introduction into a course of anatomical lectures. The people of Scotland, it is well known, are Protestants, and do not attach the same importance as the Catholics to that personage, nor hold her in the same reverence. But they shrank in disgust from the coarse terms with which Knox now launched his satire against her unchastity, and the consequence was that a class of four hundred soon dwindled to one of four; while in the neighboring and still more Calvinistic town of Glasgow, to which Knox next attempted to migrate, he escaped the compliment of a public stoning only in consequence of his now transparent insignificance.

The noblest anatomical school in the world—that of John Barclay, whom Knox had succeeded—was thus broken up, and the utter debasement of its principal member paved the way for the destruction of the system of private lecturing, which shortly afterwards followed. Liston removed to London, and, though the field was thus left comparatively open to Fergusson, he never succeeded in congregating a numerous class. A strange and not unintellectual little hunchback, named Syme, had got possession of it by means of a superior suppleness and address. Syme was a cousin, or some relative of Liston's, a high tory, and like every one who came in contact with that selfish and sensual savage, had been grossly maltreated by him. He consequently went over to the Whig, or opposite camp; and whiggery being predominant in Edinburgh, Fergusson, who attached himself to toryism, had no chance. He was, moreover, voted low, for having married a respectable tailor's daughter, with whom he received a fortune of $100,000—the Whigs of Edinburgh being remarkably fastidious on the sub-

ject of birth. His position there, in all respects, consequently, soon became exceedingly disagreeable, and he accordingly, on the earliest opportunity, exchanged it for a professorship in the British metropolis.

King's College, London, was the spot he selected. It was a nucleus of bigotry, cant, and intolerance, which had been established in opposition to the Jew University of London, or stinkomalee. A man named Arnold had previously held the office, and had the folly to abandon it because he was not allowed to retain the surgery of some opposition hospital, and indulge in other airs wholly unjustifiable. He was in fact conspicuous for nothing but for his uncouth aspect, ogre-like appearance, and a tremendous pair of jaws, which appeared to be moved by machinery. The directors of the institution had consequently become dissatisfied with his absurd pretensions, and readily welcomed the more handsome, wiry, and ductile Fergusson. The only difficulty to get over was the swallowing of the Thirty-Nine Articles of the Church of England. In their advertisement they had stipulated that the successful candidate must be an orthodox member of the Church; and some of Fergusson's friends, who knew that hitherto he had been a scrupulous Calvinist, apprehended this would prove an insuperable obstacle. Like a true man of the world, however, he bolted the obnoxious Articles, and being in other respects as staunch a Tory as the Archbishop of Canterbury himself, he was elected, and soon on the high road to fortune and fame.

In this respect we cannot blame Fergusson inordinately, nor judge of him by the higher rules of political morality. The medical profession is unhappily in England so degraded, that no member of it is allowed to hold an independent opinion, if that opinion be in opposition to the existing powers. If a Whig government be in office, he may possibly venture on a slight show of liberal sentiments; but woe to him, if he surpasses the official scale, and entertain any thought for the freedom of man. The safer course for him, if he values his future prospects, is to take the high Tory side, to see nothing oppressive in what the people suffer, or discern naught improper in what the court does. If a member of the royal family should seduce his friend's wife, he must wink at it, or palliate the

deed; if, as in the instance of the late Duke of Cumberland and Sir Henry Halford, he should cut his valet's throat, the physician must deny it, or swear that it was an act of the valet's own. There is no act of enormity which, in so far as royalty is concerned, he is not expected either to defend or commit; and if his spirit or his integrity revolt from either, he is a marked man. He is declared seditious, and only fit to herd with the rabble. Henceforth, whatever be his abilities, he is doomed to a life of poverty, obscurity and neglect. Like the eloquent Gale Jones, he must then either sink into some hole and die; or, if he resist, the court and the government will unite to hunt and put him down with the ferocity of a blood-hound and the strength of a tiger.

Fergusson, doubtless, reflected all these things in his mind. He had seen Carpue neglected and Wardrop crushed, solely because the former maintained the dignity and independence of a man, and the other refused to make himself the unhesitating tool of a court. He had on the other hand beheld Halford and Cooper descend in wealth, and seemingly in honor, to the grave, for placing their souls and consciences at the court's disposal, while Abernethy was insulted for his independence, and Chambers ruined merely because he refused to swear away a lady's honor. He saw, on the contrary, Brodie flourishing by maintaining a sort of see saw policy between the two—professedly a liberal, and in reality a despot. It is not, therefore, a matter of surprise that, with a family and a fortune before him, he chose the beaten track; and it redounds to his credit that he did not even make a profession of liberalism. He consequently espoused Toryism as he had gulped the Thirty-Nine Articles, and we must not judge him by a standard too severe if he gulps the court, the government, and the whole of their enormities too.

Unlike many sham liberals, however, Mr. Fergusson is in reality a liberal man. There is nothing haughty in his address; there is nothing dictatorial in his diction. He is frank and free in his manner, and neither assuming nor insulting in his deportment. Unlike the late Sir Astley Cooper, or the present Sir Joseph Green, he does not swagger into the hospital wards as if he were monarch of all he surveyed; nor does he, like

the existing Sir Benjamin Brodie and Mr. Robert Keate, view the students with supercilious disdain. He is consequently a favorite with them, and with his patients too. It is wise and politic for a medical man to affect a little sympathy even if he does not feel it; but in Fergusson's instance we believe the feeling is neither assumed nor insincere.

King's College, London, at the time he joined it, was at the lowest ebb in point of reputation, utility, and public respet. It had acquired such a character for narrow bigotry and monkish intolerance, that no man of any ability would join it, or if he did join it, his influence was immediately and irredeemably lost. Mr. Thomas Bell, with a high name in science, in vain endeavored to lecture in it on Natural History; the reputation of his sarcastic namesake, Sir Charles, and of the still wittier John, would have been equally futile. In the nineteenth century its self-elected managers and proprietors—consisting chiefly of the higher and more intolerant dignitaries of the Church of England—attempted to revive all the clerical assumption and popular debasement of the ninth. Green had previously rendered the chair of Surgery ridiculous by his "flowery" eloquence, as his friends termed it, while admitting that his tropes were wholly misplaced, or "floury," as others represented it, in consequence of his being a baker's son. Arnott, the uncouth, and Frankenste-inlooking ogre to whom we have already alluded, had subsequently either frightened the students away by his aspect, or disgusted them by his drivelling. It is, therefore, no small merit to Mr. Fergusson to say, that he has not only maintained, but in some degree enhanced the reputation of the school. Though not a brilliant lecturer, but on the contrary, tedious, uninteresting and prosy, he has raised the class to a respectable body in number. We believe he has now as many as seventy or eighty pupils; and though his lectures may be tiresome, or at all events not so attractive as others, his students derive much advantage from his painstaking disposition and abilities as an operator in the adjacent hospital. In the present state of medical science, however, in London, we do not know any man who is his superior even as a lecturer. Under the base example set by its heads, the profession has become so low, that no man of ability

or independence will condescend to join it; or, if it has been his misfortune to become enrolled in its ranks, to remain in a position utterly inconsistent with all ideas of propriety or manly dignity. Wealth is yet there to be obtained, and "honors" or titles will flow; but such wealth, as in the instance of Sir Richard Croft, is often purchased at the expense of all peace of mind, and such "honors" have long ceased to be honorable. We shall, therefore, in no degree regret that Mr. Fergusson, while he acquires the one, escapes the other—or that he survives the base line of princes from whom such degrading distinctions spring.

As a lecturer we have already said sufficient of Mr. Fergusson. As an operator he is able, but not unrivalled. We attach, however, but little importance to this distinction; for, in Europe, the days of what is termed "slashing" surgery are disappearing, and a mere man-cutting butcher, like Liston, would no longer be tolerated. It is well understood that an operative might be selected from the shambles, who, with a few months' training, could be made to eclipse any of this merely maiming order, and more credit is deservedly attached to the man who patiently saves a limb than to the one who dexterovsly removes it. Fergusson, in a great measure, belongs to this new school, of which Brodie may, in some degree, be considered the founder. He does not shrink from operations, like some of its members; nor does he perform them with the want of skill and dexterity evinced by his prototype. On the contrary, he resorts to them boldly when requisite, and invariably performs them with ability and address. He is the nearest approach which England has had to the great surgeon of the Hotel Dieu, Rioux; and it is no small compliment to Mr. Fergusson to add, that in point of operative and administrative ability, he is second only to that illustrious man—though yet a long way behiud him. There is a care, a finish, and an address in French surgery, which the English have never yet been able to attain, except, perhaps, in the instance of Sir Astley Cooper, and even in him the effect was marred by the vulgar ostentation of a showman and the calculating disposition of a shopkeeper. From faults of this description Mr. Fergusson is wholly free. He invariably conducts himself with the tranquility and unobtrusiveness of a

gentleman, and, though not ignorant of the value of money, has never exhibited a mercenary disposition. We have known an instance in which he attended a wealthy merchant for six months, and submitted to be cheated out of his fee; whereas Cooper, when offered a sovereign (about $5) in his age, was wont to exclaim: "No, no, I must have the shilling too." and a guinea having been the sum he was accustomed to receive for consultation in his prime, he would grumble most ludicrously unless the additional twenty-five cents were paid him.

Mr. Fergusson, to a small extent, is an author. Fortunately for himself, or rather for the undertaking, he was selected to compile a hand-book on surgery by one Churchhill, who, having emerged from a debtor's jail, in consequence of his marriage with a candle-maker's daughter, and been thus enabled to start as a medical publisher, was in the habit of throwing a certain number of subjects into one hat, while he put the names of medical men into another, and drew forth both at random. The most incongruous selections thus were made, as in the instance of Jones, the poor believer in witchcraft, being selected to write a work upon the eye, and of Nasmyth, a *ci-devant* paper-maker, being chosen to write a work upon teeth, The nominees, of course, had to resort either to mere compilation or to wholesale appropriation from their neighbors. But in the case of Fergusson a more auspicious choice was made. It was of course impossible for him to add much novelty to a subject so hacknied as the practice of surgery—a subject on which every year in England has its writer, and every one of these writers so ephemerally sprout up, and is as speedily, as well as deservedly, forgotten. These works, in fact, are generally mere advertisements, and are intended solely for the benefit of those who entertain scruples about resorting to the puff direct. Most of them are not written by these nominal writers at all, but are generally the ill-paid productions of some literary drudge. But in the case of Fergusson it was otherwise; and he produced a really able and comprehensive manual on the science and practice of surgery.

In person, Mr. Fergusson is a tall and handsome man, about six feet high. His forehead is not lofty, but, being bald, he has an intellectual appearance. He has a clear frank eye; and,

rejoicing in a true John Bull shoulder-of-mutton pair of whiskers, he has an aspect engaging as well as jovial. His features are well formed; his address is simple, but manly and attractive. He has none of the hollow airs of the courtier yet about him—the ostentatious parade of Cooper, or the refined subtlety of Brodie. He has not, perhaps, the mental abilities of either; but on the whole we are disposed to prefer him, and to think that he is a better man. His disposition is good; he is free from sham, and he is free from sophistry. Whatever be his opinion, it is expressed with sincerity. He will never soar out of the beaten tracks of the profession, nor make perhaps any brilliant discoveries; but, take him all in all, he is qualified to become an ornament to the Court of her remarkably Gracious Majesty Queen Victoria, so soon as he gets there.

Practical Lectures on "Military Surgery." Delivered at the New York Medical College, East Thirteenth street, by ISIDOR GLÜCK, M.D., Chief Surgeon to the Hungarian (Vilmos) Hussars, and to various Hospitals during the late war in Hungary. Cor. Fellow Med. Soc. of London, etc.

The Conservative treatment of Fractures.

GENTLEMEN: Having mentioned the accidents and injuries the soldier is liable to meet with during war, as also during peace, while discharging his duties, either from inadvertence of his own or that of his comrades, having further explained the manner in which such accidents commonly happen in soldier's life, I dwelt somewhat longer on the nature, effect and treatment of *such* injuries as are likely to occur, and are *more* common in regular war or in a revolution. I treated of burns and scalds, dislocations, wounds in general, and especially of pointed, incised, lacerated and contused ones, while I mentioned only incidentally gunshot wounds, which deserve especial attention, and will therefore be separately treated of. I have confined myself to the application of such apparatus and bandages (in dislocations) as are the most practical and easy

of execution, and answering, at the same time, the purpose, be they suggested by modern improvements or of ancient date. I have subsequently explained to you in what manner fractures are occurring, as produced by the different weapons, or from a fall from or kick of a horse, or under other various circumstances, while the soldier endeavors to fulfil his duties by running, jumping, etc., etc. I made you acquainted with the nature of fractures, their symptoms and effect. I shall now proceed in explaining the surgical and medical treatment of fractures, and will also show you the manipulation necessary for preparing and applying the simplest and most effectual dressings and bandages, as applicable on the battle-field, or in the hospital.

The local treatment of fractures consists :

I. In approximation of the fractured ends, and II. in mutual retention, which is effected by a bandage, that should be reliable, simple, and in military service, easily and quickly applicable, and also cheap.

In every fracture of bones, it is necessary to watch the complications more or less associated with it.

I. The approximation of the broken ends is in general more or less easy. A permanent extension of the limb in a certain direction is required, and the adaptation of the broken ends should be made by hands.

Sometimes, however, difficulties arise therein.

1. If, for instance, in an oblique fracture, one end of the fractured bone is firmly and deeply fixed in the other end, as in fracture of the neck of the thigh and shoulder.

2. If one end protrudes through the wound in the skin, and is fixed in it as in compound fractures.

3. If the muscles surrounding the broken ends are seized with cramp.

4. If a fragment of a bone is very short and moveable, situated deep and cannot be fixed by the hand, as in fractures in the vicinity of joints in the patella and collar bone.

II. In order to retain the broken ends approximated, it is required instead of the hand to use an apparatus acting similarly ; after having

1. Learnt as near as possible the direction of the fracture to

give to the limb the position calculated best, to approximate and retain both fractured ends.

2. The contraction of the muscles surrounding the broken bone must be counteracted by *methodic pressure.*

3. The mobility and displacement of the broken ends brought near each other, must be prevented by the application of a *bandage.*

III. Amongst the complications associated with fracture, are :

1. Extravasations of blood and vesications, containing a serous yellowish and dark-brown fluid.

2. Acute or erysipelatous œdema, with tendency to an acute purulent one.

3. Stretching of the skin by the broken ends *with* or *without* a dislocation, as for instance, in oblique fractures of the tibia.

4. Division of continuity of the soft parts surrounding the bone together with access of atmospheric air, rents in the skin, excoriations, wounds, ruptures of the muscles, of tendons, ligaments, dislocation, protrusion of the broken ends outwards, incarceration of the latter, rupture of blood-vessels, &c.

Usually a fracture is called a compound one, if the appearances above (4) enumerated are present. The skin, however, ulcerates easily also by complication of the symptoms enumerated under the numbers 1, 2, 3. The bones become bare of skin, and the simple fracture turns to a compound one. In order to be able to follow the course of all those complications, the region of the fracture must always be easy of access. Every swelling of the soft parts was hitherto considered a contraindication for the application of a bandage that prevents the access to it. But *now* experience has sufficiently taught and established the fact, that a bandage producing a *methodic pressure* not only decreases the swelling, but also prevents its increase. For that reason the *methodic pressure* may also be applied advantageously in fractures, where extravasations under the skin and between the muscles, or hæmorrhages in the joints, have taken place, if only the skin is not very tense—if there are no vesications, or excoriations with a tendency to an acute purulent œdema.

But if with a fracture those complications are met, or if a

wound exists, or the skin is broken if splinters of bones protrude—then the region of the fracture should not be covered entirely with a bandage, in order to permit watching of the complication. On the other hand, it is absolutely necessary even in those cases to approximate the ends of the divided bone, and to retain them *immoveable*. If this is not accomplished, the splinters and broken ends come out of place, and by the contraction of the muscles constantly moved, they produce ulcerations of the soft parts, encourage suppuration, and thus impede the curative process in its progress. It is, therefore, obvious that in the treatment of simple fractures that bandage deserves preference that keeps the ends of the broken bone in mutual *immoveable* approximation.

I.—*Starch, Dextrin, Wadding, Plaster, Gypsum, and Gutta Percha Bandages.*

Without entering into the proceeding used by the Chiloe Indians, namely, that of surrounding fractures and wounds by hemp, or that of the Arabian, who buried his fractured leg in fresh soil, and there expected the recovery; and without stopping to dwell on the case of the carpenter, who having cut deep his thumb, quickly covered his wound with blotting paper, and applied small chips as splints, pasting over the whole with thick glue, and then continued his work—I will draw your attention to the development which the hardened and surrounding bandages, with or without wadding, have attained, and as now in practice on the battle-field as well as in military hospitals. The practicability of introducing them in civil hospitals also is evident from the fact that in many, similar bandages have been used with the greatest advantage.

When treating of dislocations, their reduction, and the mode of retention of the replaced bones, I have shown you the manipulation of preparing and applying the starch and dertrin bandages, reverting also to the gutta percha bandages. To avoid repetitions, I will now, in the treatment of fractures by means of bandages, merely allude to them, while I intend to make you acquainted with one sort of bandages lately used in the field, as well as in the hospitals to the greatest extent, and with the most favorable result. These are:

Gypsum or Stucco Bandages.

Although even in compound fractures, where the wounded place has to be left uncovered, the application of Seutin's starch bandage answers this purpose best, still there are some objections to its being used in the field, or even in the hospital.

1. *It dries too slowly*, and cannot replace therefore *immediately* manual extension, what is required in order to retain the ends of the broken bone in mutual contact. It is, therefore, neces sary to use machines or apparatus till the bandage becomes dry for 24–48 hours.

2. The *thickness* of the walls of the bandage *diminishes*, while the bandage becomes dry, and thus receding somewhat from the limb, cannot serve instead of the *manual extension*.

3. The application of the starch bandage costs on the field much time and trouble. The limb must first of all be surrounded by a roller, then covered with compresses, and rollers, pasteboard and splints are then applied, and the whole again surrounded by a roller. The application of openings (windows) in Seutin's bandage is combined with difficulties. If the windows are made at the time when the bandage is applied, the same keeps *badly* together the fractured ends and wood or tin splints must be used—if the windows have to be made when the bandage is *dry*, the wounded portion remains covered for a day or longer, and the excision or formation of the openings is in the hardened starch bandage yet more troublesome.

4. However dexterously we may apply the bandage, it will be pretty difficult to make so large openings as required, in order to expose the injured portion without loosening at the same time the *whole bandage*, while small openings or windows expose but a portion of the injured part.

5. In suppurating wounds, the pus discharged, as well as the fluid applied for cleansing the wound, and the moisture of the cataplasms will run under the bandage and destroy the epidermis.

6. The hardening and unequally contracting starch bandage, (i. e. quickly hardening at its thin portions, and slower in its thicker ones) ; exerts an unequal pressure and therefore an injurious effect on the *swollen parts*.

7. The starch bandage cannot be applied for transporting the wounded soldier, who receives on the battle-field a compound fracture, because it requires warm water, (not always ready in the field) for preparing it; then again it dries slowly, the formation of windows causes loss of time and trouble, requiring the application of splints, and because the parts being covered for a day or two, are injured as suppuration may follow, and the pus stagnates and runs into the bandage; in damp weather it becomes *moist* and *soft* in the rain; it is, therefore, necessary to have ready-made *capsules* of starch bandage, and the so-called *movo-amovible* bandage, which often do not appose sufficiently, and cannot therefore replace manual extension.

Recently gypsum bandages have been suggested in Belgium, but their application, according to Dr. Mathieson and Van De Loo, is troublesome, and takes much time, so precious on the battle-field. This bandage is not lasting, its preparation and preservation still more difficult than that of Sentin's starch bandage, much more preferable and practical is the preparation and application of *gypsum bandages*, as made by Pirogoff,* and used by him to the greatest extent with the best results.

The gypsum bandage is *on the battle-field* in many respects preferable to the starch bandage.

The gypsum solution requires but *cold* water, and turns *hard* as soon as applied, and replaces therefore *immediately* manual extension, and neither machines nor apparatus are required for that purpose. The dry gypsum bandage becomes so hard, that *no* splints are required, even if large windows are made, and transporting of the wounded soldier is *immediately* after the application of the bandage possible without injury.

The gypsum bandage is *simple* and *cheap*, as it consists of old *coarse linen* and *gypsum*; its application is simple and quickly made. The gypsum bandage replaces manual extension *perfectly*, the assistants need only for *a few minutes* keep the limb extended after the bandage has been applied, then the gypsum bandage is *stiff* and *hard* enough to retain the ends of the broken bone in the position given to them. Their displacement is *impossible* as long as the swelling does not diminish, and a *considerable* interspace is not formed between the limb

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and the bandage. Thus the gypsum bandage renders superfluous all machines for extension, as required, while the *starch bandage* becomes *dry*. Only by the application of the gypsum bandage in *oblique* fractures of the *thigh* it is necessary to fix the pelvis, and to retain the limb extended by means of a *bed-table*, and by weights attached to the extremity.

More apparent yet are the advantages of the gypsum bandage in oblique fractures, where the ends of the broken bone are *distant* from each other, in compound fractures and generally everywhere where it is necessary to keep open a wounded spot.

In Pirogoff's mode of applying the gypsum bandage, the openings (windows) may be made *at once*, through them it is possible to view the position of the broken ends, the excoriations and wounds, and the curative process may be watched in its course.

The gypsum bandage does not contract like the starch bandage, interspaces form *slower* between it and the leg, as in the gypsum bandage the interspaces depend upon the *decrease* only of the swelling, and not like in starch bandages also, from unequal hardening of the bandage, and then again it does not become moist and soft in rainy weather.

In complicated fractures the pus may be discharged, and find exit through the large windows made, and does not burrow itself *under* the bandage as is common in the *starch* one.

Wet dressings may be applied *immediately* on the wound itself. The gypsum bandage becomes hard immediately after having been applied; wounded soldiers may therefore be safely transported *immediately* after application of the gypsum bandage, from one place to another, even in the rain, without the bandage being disturbed, although the gypsum bandage may appear *wet* externally, which sometimes lasts for a few hours.

The gypsum bandage may therefore be cut through immediately after the application in the interspace of the splints, if that should be required, in consequence of too great a pressure or pains, &c.

In the battle-field as well as in the hospitals, for transportation of the wounded soldier in the treatment of complicated fractures, with great dislocation of the ends of the fractured

bones, the gypsum bandage is preferable *to every other* kind of bandages.

Requisites necessary for the application of Gypsum Bandages in the battle-field as well as in the hospitals.

1. Long, old hospital stockings made of linen, cut in front along the seam, (if the seam is behind the stocking it must be turned and cut); old drawers also cut along the seam, and divided for one or the other limb; sleeves of old shirts, (or instead of those long linen flaps cut in the form of stockings); drawers or sleeves); jackets or old vests, abdominal bandages covering the body once and half; for fractures of the bones of the rump, pelvis, and of the neck of the thigh and bone.

These pieces of linen used for surrounding the limb must be *equal, soft* and *dense*. All seams must be removed.

2. *Cotton* or cleaned soft *flax, pads* filled with soft material, lint or flax for filling up, (for instance, around the trochanters, around the malleoli in the popliteal region, and around the achilles tendons) simple and graduated compresses.

3. *Splints* of different dimensions in regard of length, width and thickness, made of old coarse *sack linen*, as used for instance in hospitals for mattrasses or straw mattrasses.

The old sack linen is folded twice, trice or four times, to the width of two fingers to one-third of a yard. The splints must in fractures of the leg, the upper and forearm exceed at least one-third of a yard the fractured bone, and in fractures of the *thigh*, and that of the neck of thigh it must be one-third of a yard longer than the *whole* extremity.

4. Strips (compresses) of the same linen from ·2 inches wide, and of such a length as to surround the limb once or twice, they are calculated to fasten the splints, and are called *transversal* stripes (Pirogoff). These transversal stripes may be made also of fine linen, if the bandage should be a light one.

5. Plaster of Paris (gypsum) in form of fine powder and well dried. For the application of a bandage, never less than 2 lb. have to be used (as for fracture of the forearm,) nor more than 7 lb., as for fracture of the neck of the thigh bone.

6. A vessel with cold water. The gypsum solution should not harden sooner than in five or eight minutes, in order to allow the application of the bandage. Although hardened, it still looks wet from the evaporation of the water, out of the bandage painted over with gypsum solution, and the patient may safely be carried with it.

7. *Large brushes* as used by house painters.

Besides those necessary requisites in hospitals, may be used finer linen rollers for simple fractures and splints made out of pasteboard, and for complicated fractures, with large wounds, *splints of* wood, of different dimensions, together with pads attached to them on both ends, and also a few pieces of sheet iron or tin may be held ready.

II.—The Applicaaion of Gypsum Bandages,

Is made in the following way:

The injured limb is first surrounded with dry linen, a sleeve, a linen stocking, or with half a drawer.

Bony prominences must be wadded, and hollows filled out with cotton. The linen surrounding it must not be too thin, nor have holes in it, in which case the linen must be doubled, or the limb first covered by cotton. If this is not done the moisture presses to the skin. and the patient complains of a cold or burning sensation.

2. The broken limb is put in the required position, the extension is then made, and the fractured ends then aproximated. Sometimes it is necessary to begin with the reduction, and subsequently follows the surrounding of the limb.

3. The splints and the transverse strips of sack linen, each three or four times folded, are put near the patient *in that* order as required to be later applied to the limb.

An assistant prepares the solution of gypsum and paints with it the splints and strips, or rather dips them into the solution and brushes them with it.

The proper application of the bandage depends now upon the gypsum solution. If the solution be too *thick* it dries *quick*, the splints and transverse strips are not *united* firmly together: nor are the splints firmly fixed if the solution be too thin. When the solution becomes denser. water must not be added to

it, as the solution becomes through it creamy, is not imbibed by the linen, cannot be smoothed, does not adhere, and takes a long time to become dry.

5. The splints and strips of linen must be dipped in the solution, which I now prepare by adding to two pounds of water the equal weight of gypsum. They must be extended and swinging free, and must thus be brushed over on both sides with the gypsum solution as you see it here.

6. The splints must be applied longitudinally to the limb, and must be fixed by the transverse strips, carried around both the limb and splint. The transverse strips are applied in pairs, so that the one should cover the other partially.

The splints may be applied in such a manner that the one should cover the other partially, or, what is preferable, in such a way that between the splints should remain a free open space on *the side* in *front of*, or *behind* of the limb. The assistants producing extension must continue to do so until the bandage is *hardened*, i. e., about eight minutes after the gypsum bandage has been applied. During its application the limb must be kept extended free, in order to be accessible from all sides. The splints must be pressed firmly to the limb by the hand. The *transverse* strips must be drawn firmly and tightened around the limb, and by the hand or brush well covered with gypsum solution, in order that all prominences and hollows should be equalized. In oblique fractures and dislocations of the fractured ends, at least two layers of transverse strips are necessary. But if the bandage has yet to be removed, it is necessary—

1st. To apply the splints so as to leave a space between them.

2d. The transverse strips are covered from the middle (where about the extent of two inches remains uncovered) towards their ends with gypsum solution.

3d. The transverse strips are applied so that the uncovered part should correspond in its situation to the longitudinal interspace between the splints.

In the field it is necessary to have arranged, before the application of a bandage, all requisites in one package for each fracture separate. Thus, for fracture of the forearm, the band-

ages should be separate from those for fracture of the leg, as you see it here.

Fracture of the Forearm.

The carpal bones, the radial margin, and that of the ulna are like the palmar surface of the hand, covered, as you see, with wadding. The whole forearm I now cover with a shirt sleeve cut open, and make some incisions in it, in order to be able to apply the sleeve smoother. The forearm must be bent in the cubitus. The extension must thus be made on the hand, and the counter extension on the under end of the shoulder. The radial margin must look upwards, the ulnar one downwards. The hand must, according to the direction of the broken ends be abduced inwards or outwards. The palmar and dorsal side of the forearm must be covered with graduated compresses. On these the gypsum splints are applied, and with two layers of transverse strips about six inches wide fastened and extending from the condyles of the upper arm, as you see here, to the fingers. Sometimes the hand must be fixed at an obtuse angle with the forearm, in order to facilitate the adaptation and union in oblique fractures.

Fracture of the Olecranon.

The forearm must be completely extended, if the fractured upper end is drawn high upwards, or else the forearm must be a little bent. The upper fragment must be pushed down by means of the fingers, and approximated to the lower end. Wadding should be placed around the upper fragment and the elbow. The *whole arm* is then placed in a cut sleeve of a shirt. A circular compress must be applied above the upper broken end, which thus will be pushed downwards.

A gypsum splint is placed on the back part of the upper arm. It must be a hand wide, and long enough to reach from the shoulder joint to the upper broken end. Another gypsum splint, of the length of the *whole arm*, is applied to the inner side. Five or six *transverse strips*, five or six inches wide, fix the splints to the upper arm, elbow joint, and the forearm. As you see the application of the bandage takes but little time.

Fracture of the Condyles of the Lower End of the Humerus.

The arm must be bent at the elbow, the fractured ends approached to each other by pressure on the olecranon, exerted from *behind* and sideways (internally and externally), on the condyles. The extension should be made on the upper part of the forearm, while bent. The whole upper extremity is placed in a sleeve; its condyles, olecranon, and elbow, are surrounded with wadding. A circular longuette is applied around the elbow joint. One gypsum splint is applied to the back of the limb, as wide as the hand is long; another similar splint on its inner side. Transverse incisions must be made on both sides of the splints, in the region of the elbow joint, in order to fix them easier and smoother. Five *transverse strips*, in double layers, of the same width and length as in fracture of the olecranon are then applied.

Fracture in the Middle of the Humerus.

The arm must be bent in the elbow, and extension made in the upper third of the forearm. The same bandage applied as in fractures of the lower third. If the fractured ends are much dislocated, the extremity must be fastened to the trunk as in fractures of the neck of the upper arm.

Fracture of the Neck of the Humerus.

The trunk is surrounded by a corset or linen cut in the same way, or the patient is dressed in a linen jacket, with sleeves cut open, or with a vest, &c. A conical pad is placed in the axilla. The injured limb must be abduced from the trunk at an acute angle and surrounded with a cut-open sleeve. The armpit, condyles, and elbow joint are protected with wadding. A strong compress is applied *between the shoulder* blades. An assistant fixes with his hands the trunk and the shoulder blade of the injured side. Another one *bends* the forearm in the elbow joint, and extends the upper arm in its lower third. The surgeon grasps with both hands the *head* of the shoulder, and crowds out the fractured end of the axilla. A long gypsum splint, bent at a right angle, and hand-wide, is placed along the back of the limb, from the acromion to the hand; another

splint is applied to the front of the limb, reaching from the armpit also to the hand.

Incisions must be made on both margins of the splints, in the region of the shoulder and elbow joints, in order to facilitate their adaptation. The splints must be pressed on the limb and surrounded by five transverse strips in single layers. The limb is then brought near the trunk and fastened to it by means of a strip eight or ten inches wide. This broad strip is covered with narrower strips, three or four inches broad, as in the third bandage of Dessault for the fracture of the collar bone.

If the broken ends are not much dislocated, a single splint in front, or one behind, fixed to the limb, brought near the trunk by transverse strips, is entirely sufficient. I require for the application of this bandage the kind assistance of Drs. P. and D., besides that of Dr. H.; it is, however, not necessary that the assistants should be medical men, and soldiers may do you the same service, although perhaps not so adroitly as our friends here did it.

Fracture of the Clavicle and of the Acromion.

The trunk and the limb are enclosed, as in fractures of the neck of the shoulder, in a jacket, vest, etc. In the axilla is placed a conical pad, with the obtuse angle upwards. Between the shoulder blades a strong compress. The fracture is reduced by drawing backwards both shoulder blades, and carrying the shoulder backwards, and pushing the elbow from below upwards. In this position, the arm being bent at the elbow, is fixed to the trunk, by a broad transverse strip of gypsum bandage. On the fracture is placed a long graduated compress. The whole together is then fastened by Dessault's third (triangular) bandage, made of two or three long transverse strips (three yards long and four fingers wide).

Fracture of the Ribs and of the Body of the Shoulder Blade.

The rump is enveloped, as in fractures of the clavicle. Between the shoulders a strong graduated compress is placed, and in the axilla wadding. A broad strip around the rump, from the axilla to the lower false ribs, half a yard broad.

Above the clavicles, two strips, painted with gypsum solution and fastened to the transverse belt. Over it another strip, half as narrow and twice as long as the first ones, twice around the trunk.

In fracture of one of the first three upper ribs, some strips are carried over both clavicles in the form of a cross. In all this kind of fractures the bandage is applied in the sitting posture.

In the preparation of splints for fractures of the upper extremities, the coarse sack linen is doubled or taken threefold.

Fracture of the Leg (Tibia and Fibula).

The leg and the foot is enveloped in a stocking cut open along the seam. The *heel* is put in the stocking cut out, and remains uncovered. Around the malleoli, on the dorsum of the tibia, on the hamstrings, in the popliteal space, and on the kneecap, as well as on the dorsal side of the foot, wadding is placed.

With considerable displacement, the extension is made by half flexion of the knee joint, otherwise with extension of the knee. A splint one-eight of a yard wide, and reaching from the knee to the *heel*, is placed on the back of the limb. Two other splints, three fingers wide, extending from the patella to the toe, are put on both sides of the leg. Both splints are fixed firmly to the leg, and after having been incised in the neighborhood of the ankle, they must be covered with four or five transverse strips. These transverse strips are one-third of a yard wide and applied in double layers. The front splint must be fastened to the back of the foot by two other small transverse strips. The *heel* remains uncovered.

If the broken ends are distant from each other, as often happens in fractures of the leg, it is necessary, in order to accomplish the reduction, to lift the heel, to be able to approximate the lower fragment to the upper fractured surface, or the foot must be bent much inwards, and retained in this position by assistants, until the bandage is hardened; if the skin is irritated by a fragment, or threatened to be pierced, the application of openings (windows) is necessary, in order to be able to examine at will the injured spot..

Transverse Fracture of the Patella.

The application of the bandage must be made in the half-sitting position of the patient. The knee must be stretched, the injured limb lifted, and the thigh-bone bent in the hip-joint under an acute angle.

The whole limb is now enveloped in an old half of a drawer. Wadding must be placed in the regions mentioned at the front of the leg. The upper fragment of the knee-cap must be approximated to the lower one, with the hands as much as possible, and retained in this position by the hands by graduated compresses and (circle tours) rollers. On these are applied in the bend of the knee, two or three layers of transverse strips (three fingers wide) in figure 8 turns.

On the back of the limb is also placed a splint five inches wide, reaching from the tuberositas ischii to the heel, it must be fastened with transverse strips to the leg, knee and thigh.

Fracture of the Lower End of the Thigh.

Extension while laying on the back. An assistant fixes the pelvis, another one stretches the knee, seizes the foot in the vicinity of the malleoli and extends it. The reduction is effected by seizing with both hands the broken ends, together with the soft parts. The whole limb must be enveloped, as in the treatment of the fracture of the knee-cap.

One long splint (6 inches wide) is placed on the back of the whole extremity, from the tuberositas ischii, extending to the heel ; another equally wide splint is put on the front from the groin, extending to the toes. Both are fixed by five or six transverse strips (five inches wide) in two layers. The lower end of the front splint must also be fastened by two or three narrow strips, carried around the back of the foot in eight tours, leaving the heel uncovered.

Fractures of the Upper and Middle Third of the Thigh Bone and of the Pelvis.

Extension while the patient is laid horizontally. The pelvis must be fixed firmly by a strong assistant pressing the hip bones to a mattrass. The assistant must take care that the

crista ilii be laid equally high on both sides. The whole lower extremity of the injured side, and the whole pelvis must be enveloped in a divided drawers, cut open along the seam.

The whole pelvis must then be surrounded by *wide* bandages, covering the crista of the hip bones and the large trochanters. Wadding or hemp must be placed on the malleoli, the back of the foot, around the knee-joint, on the spina cruralis, in the inguinal region, around the trochanter major and the perineum.

The extension is made by lifting up the extremity, bent at the knee-joint, and grasping the foot, as is usually done taking in off another person's boots.

A gypsum bandage, the middle and lower part about six inches wide, on the upper, however, somewhat more than seven inches, is placed on the outer side of the extremity, it reaches from the crista ilii to the sole. In different regions, as opposite the inguinal on the knee and foot-joint, it must be incised. A second splint of the same width, reaching from the perineum to the sole, is applied to the inner side. In the groin and on the back of the foot, the splints must not only *touch* each other at their margins, but also overlap somewhat. The upper ends of the outer and inner splints are fastened to the pelvis by broad transverse strips, which surround the pelvis, once and a half ways, to the extent of four fingers, in two layers, applied like a spica in figure 8 turns. Both splints must be pressed by the hands, and fastened to the thigh and leg by five or six transverse strips of four inches, applied in two layers. The lower end of the splints must be bent *towards* and *to* the foot-sole ; strips three fingers wide are fixed to the foot and its back. The heel remains uncovered. The extension of the limb must be continued until the bandage is dry.

If the dislocation of the broken ends is considerable, and the limb much shortened, then instead of a simple bandage, a double transverse strip must be carried around the pelvis in form of 8. In this case it is also necessary that *one* should fix the splints to the pelvis, while *another* presses at the same time the splints to the back of the foot and to the knee. By this proceeding time is gained, and the bandage drying on those parts, quickly acts like an extending machine, preventing the bones slipping over each other, and the pelvis from being displaced.

In fractures of the lower extremity, the coarse sack-linen used for splints must be taken and folded in four, or at least three. Pirogoff's experience is, that in oblique fractures of the upper or middle thirds of the thigh, the bandage cannot be applied so accurately as to answer all desiderta.

The manual extension, the fixing of the pelvis *only* by assistants, the lifting of the patient from the bed, in order to carry around him the bandages, and the application of transverse strips around the pelvis and hip joint, all prevent the accurate application of the bandage.

After the bandage has been applied, it is very difficult to know whether the pelvis is adjusted, and the limb sufficiently extended.

The hands alone of the assistants can neither fix the pelvis, if the fractured ends are displaced, nor perform continued extension.

The application of the bandage (spica) around the pelvis prevents still more the fixation of the pelvis, as well as the extension of the limb. The assistants who have to stand near the patient, prevent the surgeon from executing the necessary manipulations, and superintending the application of the bandage.

In order to obviate all these difficulties, the patient is placed during the application of the gypsum bandage in fractures of the thigh, on a peculiar bench, consisting of three removable pieces, provided with short feet, [bedboard] bettbrett which may be placed on the mattrass of a second bed, close to that of the patient, who then is laid on the bedboard, which elevates him half a foot, and better allows the application of the bandage.

To the upper piece calculated for receiving the trunk, both crests of the ilium are fixed by a simple mechanical contrivance. The extension of the limb is produced by weights attached to the stocking.

First the bandage is applied around the pelvis, after having removed the narrow middle piece, corresponding to the pelvis, so that the sacrum lies free. The patient, therefore, is not lifted, and the injured limb does not require to be moved upwards and downwards.

At first two layers of sack linen strips, spread with gypsum solution are placed like a Scultetus bandage on the bed-board, after having put it on a second empty bed, in the vicinity of the patient. The injured extremity must be enveloped, as mentioned, with linen, and surrounded where necessary with wadding, and then the patient is cautiously removed under continual extension from his bed onto the bed-board.

The board being elevated on feet of from 3 to 6 inches, the patient is raised high, and thus the application of the bandage is facilitated to the surgeon and assistants.

The patient lies with the sacrum on the middle board, and the injured limb, from the groin to the fort, rests on the bandage ready made upon the foot-board. The tubera ischii are situated below the prominence (elevation) of the foot-board. The crests of the hip-bones lay between the excavations of the horns. The horns are firmly pressed upon, and fixed to the hip-bone. They are situated exactly between the anterior, superior, spina ilii, and the trochanter major, and can be fixed in every situation by means of the screws.

The middle board is then removed, the sacrum of the patient thus lies free, so as to allow the circular bandage to be carried around it.

Subsequently, a broad band, with a weight, is attached to the foot-joint, and hung over the roller. The bandage is now applied. The middle board is then again pushed in, and the patient remains for some time on the bed-board, until the gypsum bandage is hardened and dry. If the extension should be necessary to be continued, he remains on the bed-board for some time longer.

Treatment of Compound Fractures.

The displacement of the fragments *in fractures* of the bone, is a frequent and very unfavorable accident, which with the degree of complication becomes more dangerous, and its treatment more difficult and tedious.

If a displaced unreduced fractured bone is not consolidated, united by the exudation of callus, the consequence is a *Pseudarthrosis*, which is not easily remedied. But if the fractured bone is firmly united by a callous mass, the displaced broken

ends thus united, cause the limb to appear deformed or shortened, curved, and it may be useless. Although amputation might be justifiable in many similar cases, it nevertheless becomes the imperative duty of the military surgeon, to try the conservative plan of retaining the limb, or some parts of it. The great triumph achieved by modern military and civil surgeons, in retaining what formerly used to be removed by rule, distinguishes modern from ancient surgery, and the experience herein of military as well as of civil surgeons, warrants a trial and imitation of the treatment on conservative principles. I shall for that reason dwell somewhat longer on the means of facilitating the conservation of the endangered parts, and I will consider,

(*a*) The re-position of the fragments in serious complicated fractures in general, and those with splinters.

(*b*) The situation of the limb in the extended or bent position, or on swings.

(*c*) The mode of extension and retention in complicated fractures in general.

(*a*) *Re-position or Reduction of the Fractured Bones,*

is somewhat tedious to both surgeon and patient—to the former on account of the great displacement, the re-position being impeded by wounds, swelling, and muscular spasm—to the patient on account of the immense pains the re-position causes under similar circumstances. If the bone is, however, *totally* crushed, and the fracture thus a comminuted one, the re-position is more easily accomplished, and it may even happen that if the bone be splintered, no displacement in the longitudinal diameter of the bone occurred, as you will hear when I come to treat of comminuted fractures produced by *gunshot*.

It is necessary to be cautious in manipulations for re-position of so severe fractures, and it is preferable to allow a shortening of the limb for the means of retaining the parts thus displaced are utterly inapplicable on account of their positively injurious effect. By forcible traction, tension or reduction, the irritated parts become still more injured, the sharp ends of the splinters being driven into the soft parts by such a manipulation, and hence hæmorrhages may arise, and also

severe pain. The muscular spasms, which often occur, in splintered fractures of the leg for instance, supervene in the first two or three nights after the reduction, in the form of *sudden, convulsive, painful* contractions of the limb, disturbing and rousing the patient suddenly, displacing by it the reduced splinters so much that a new re-position becomes necessary, frequently the spasms associate with inflammations and are thus still more dangerous.

A slightly bent position of the limb, together with a small dose of opium or *cannabis indica*, or chloroform inhaled, and in the inflammatory stages abstraction of blood, warm water dressings and fomentations, are used under such circumstances often with benefit. *Tetanus*, however, is to be apprehended. The reposition alone is not sufficient to evade those fatal muscular spasms, although the reduction, if successfully accomplished, and the parts if thus retained, may contribute much to the alleviation of the spasm. Reposition should be tried without an apparatus, but the extension should be confided to intelligent assistants.

(*b.*) *The Situation of the Injured Limb in the Extended or Bent Position, or on Swings.*

The severely injured limb, and the easily displaced splinters, require above all *rest* and the most secure and comfortable position. The situation must be firm, without pressing unequally. The position of the limb must be retained *unchanged* for a longer time. The vulnerable parts have to be protected against *bedsores*. The heel, the malleoli, the tendinous prominences of the heel, and the internal condyles of the shoulder should rest on a ring filled with horse hair, or on Gariel's air cushion, or at least be provided with wadding and protected.

In order to facilitate the movements of the body without disturbing the injured limb, *swings* may be used with great advantage, chiefly in injuries of the leg. The simplest is the best. *Gutta percha* swings may be considered the most suitable, and are constructed in this way: A plate of gutta percha of two millimeters thickness, from fourteen to eighteen inches square, is bent, and by its four corners suspended by

means of bands and hooks on a roller fastened to an iron stand, having a cross bar, which may be fixed higher or lower. The lateral compression exerted by the swing on the limb commends it, together with the advantage of producing by its hardness a gradual and moderate reduction, a lasting mild retention, which serves as a lateral splint. The gutta percha swing being of an indestructible material, resisting the water, pus, use and time (allowing therefore the irrigations with water), remaining always smooth, never breaks, and is therefore preferable to the *wash-linen swings* that last but a short time, to the *leather swings*, that soon offend by their odor, and to the *wooden swings*, which are too heavy. The foot may also be fixed by a *sole-plate* or by bands.

The situation of the limb, bent in the joints, as the lateral one, or on simple or double inclined planes, the angle of which may be variously altered, is proved to be the most comfortable to the patient; the most secure, applicable to all limbs, and most adapted for the spontaneous adaptation and retention of the fragments. The long time required for the union of similar fractures demands the *quiet secure* position of the limb, and this by natural as everybody may convince himself, the *semi-flexion*. After a certain time passive movements should he made with the limb, in order that the joint, thus half bent, should not become stiff, and that in consequence of the unequal extension of the several parts composing the joint, may not become irritated or relaxed.

The situation and apparatus are various for the different limbs. For the upper extremity *straw* cushions are used covered with gutta percha, of paper thickness, on it the arm is laid, *half bent* in the elbow, between pronation and supination, or in one or both directions, according to the injury of the soft parts. If the forearm lays on the front side, a soft *ball* should be placed in the hand, in order to bring the fingers also in the half-bent position. The gutta percha swing may be modified for the arm, and used in injuries of the elbow. A gutta percha plate embraces the arm and is suspended on one of the iron stands. A second gutta percha plate receives the forearm and the hand suspended on a separate stand. Both gutta percha plates are at angle to each other, described by the more

or less bent elbow, and touch each other on the inner concave side of the angle, where they can be fixed to each other by a band or hook. The hiatus thus formed on the outer convex side of the angle, in which the elbow itself lays, may be closed by a small *valve*, to be fixed to the first mentioned two plates of gutta percha, which, if dropped, allows access to the wounds, abscesses, bed-sores of the elbow, and the inner condyle and permits, the application of dressing in that place.

For the lower extremity, and especially for the injuries of the thigh, well-cushioned boxes may be used advantageously, the lateral walls of which may be dropped or reverted and its angle varied at will by means of *hinges* and *double screws*. The situation of the limb is by the lateral pressure of the wall a secure one. For the leg Heister's apparatus is the best, it consists of a long box with side walls to be dropped, a foot-board, easily changeable in its situation and angle, and provided with an excision for receiving the heel.

(*c.*) *The Mode of Extension and Reduction in Complicated Fractures in General—Where and How it is Applicable in the Conservative Method in General and in Particular.*

The displacement of the fragments is influenced not only by casual external circumstances, causing movements of the injured soldier, from the moment of his falling down, and that of the injury, and through the whole time of his being transported, but the displacement also depends upon the *active muscular contractions*. Hitherto all points of the bones irreducible into the soft parts, and therefore prominent, used to be removed by the saw or resected. Jeffrey's chain saw answers this purpose best, after a thin gutta percha plate is used for protecting the soft parts during its application and use. Slight bony points may be removed by strong forceps. But Malgaigne proved by his observations how advantageously the prominent bones may be replaced by a permanent depression of them by means of awls, which are screwed into the prominent points from a fixed position, and thus cause them to be imbedded in and united with callus (appareil a vis.) By its use from two to four weeks, the callus exudation is firm enough to keep firm the bony fragment.

The extension is best effected by long towels, carried around the body under the armpits, over the head of the bed, and thus producing the *fixation* or counter-extension of the body, while by a well-cushioned leather belt, provided with straps and buckles, or cords with rings moveable in the necessary directions, the extension is made.

Reduction or re-position has sometimes to be left to the force of nature, and is effected by *muscular contraction.* If fractures splintered to a very great extent, are left to spontaneous contraction by the activity of the muscles on the inclined plane, by placing the limb in the most natural direction possible, by an adapted situation and lateral compression the extremity may become shortened or somewhat deformed, but will still be conserved, and its defects may be better remedied.

II. The Gypsum Bandage applied in Complicated Fractures.

In fractures complicated with injuries of the skin, with considerable contusions, vesications, by tendency of the skin to soreness in the region of the injury, and by great displacement of the fractured ends, it is necessary to apply the gypsum bandage with openings, (windows) and to leave the injured portion uncovered. The windows of different sizes are made during application of the bandage, and may be formed in two ways.

1. Leaving interspaces between the splints and the transverse strips, to be fixed in the region corresponding to the injury, or

2. By applying on both sides of the limb, or in the front and back of it, wooden splints, provided on both ends with thick pads, and by fastening them by transverse strips.

First method. The limb must be enveloped, (as in simple fractures) in an old sleeve or a stocking, or in divided drawers, only with the difference, that the linen is cut transversely in the region of the fracture, and the flap of it thus produced is not pressed to the limb. The extension and re-position is then effected, and to the limb the necessary situation is given, removing thus the broken ends from the skin threatened to be pierced. The splints must be thicker than in simple fractures, and applied on both sides, and over and under the fractured spot, leaving free the injured portion as well as its

circumference. The splints must closely fit in other parts, and are then fixed by 2 or 3 layers of transverse strips, going once or twice around the limb, *above* and *below* the injured region.

On the fractured spot, or in the region of the sore skin, the transverse strips surround the splints only partly, and opposite to the wounded portion, the ends are carried to the margin of the opening, (window) and then reverted on the limb.

But if only one side has to remain uncovered, a splint may be applied to it in the described manner, and to the other side a gypsum splint.

If in complicated or simple fractures a very firm bandage is required, as for instance in fractures in the neighborhood of joints, by the preparation of the splints, pasteboard, sugar-paper. etc., may be placed in the linen layers after having been painted over on both sides with gypsum solution.

In complicated fractures, where profuse suppuration may be anticipated, the window must be formed so that the pus should not find its way under the bandage. The margins of the window must be sufficiently distant from each other.

The application of Pirogoff's gypsum bandages in simple as well as complicated fractures, is calculated for the battle-field.

In hospitals where more time can be taken and the means allow it, it is preferable to take instead of the sack-linen rollers, linen flaps and cotton or flax. The bandage lays thus firmly and is light. If a roller is applied instead of the transverse strips, the gypsum bandage is fixed in this way:

1. The limb is surrounded by old linen, and on two or three sides provided with splints, leaving an interspace between them.

2. The splints are firmly prepared and fixed to the limb, and then surrounded by circular turns of a roller, in the vicinity of the joints in figure eight turns, (spica testudo.)

3. While the roller is carried around the limb, its outer surface is painted over with gypsum solution (by the hand or a brush,) but so as to leave the place corresponding to the interspace free of gypsum. In order to facilitate the cutting open and removal of the bandage, a piece of roller dipped in *oil* should be placed in the interspace of the splints.

If it is necessary to press the splints in the wounded region

still firmer to the limb, they may be fastened by strong thread or by a dry roller carried circularly, (which has to be removed when the bandage gets dry,) or two or three transverse strips three quarters of a yard long, are painted over both sides with gypsum solution, leaving in the middle about an inch free from the gypsum solution. The part free from gypsum is placed over the window in the bandage, and the painted ends are carried around the limb, bringing by it the splints close to the limb. As soon as the bandage is dry and firm, the unpainted part of the strips covering the window is cut through by a pair of scissors.

On the injured portion is placed, through the window, lint dipped in camphor, or fomentations of sugar of lead, etc., or in injuries of the skin with vesications, a solution of nitrate of silver (from two to fifteen grains in one ounce of water) is applied.

Second Method. The limb is surrounded with old linen above and below the fractured portions; the injured part remains uncovered in its whole circumference, or one side only, according to the extent of the place to be left uncovered. Long wooden splints are then applied on both sides or in front, and on the side the splints are provided with thick pads turned towards the limb, and fixed so that the pads, at least six inches wide, should be placed close and firmly to the limb the splints then are fastened to it by transverse strips in the region of the pads. By this proceeding the splints remain distant from the injured place to the extent of the thickness of the pad, therefore nearly six inches. If the injury is considerable or on both sides of the limb, one single splint may also be sufficient. In this case, it is advisable to fix it first by thin English sheet iron, and subsequently with transverse strips. In complicated fractures the gypsum bandage may be applied in the following way:

Having applied the splints so as to leave uncovered the injured part, the same are fixed by a dry roller, which is to be painted while carried around, leaving a part unpainted. On that portion, the dry linen is cut through by scissors; the ends of the strips thus formed are then turned downwards, and by means of the gypsum solution fixed to the sides, in which case

the solution must be prepared with glue in order to harden slowly. Other changes can also be made in the gypsum bandage as applied by Pirogoff: for instance, first a layer of strips immersed in gypsum solution, then splints, and again a second layer of transverse strips to fix the splints. Sometimes the splints are at first fastened by thread and then by transverse strips.

III. The Removal of the Gypsum Bandage from the Limb,

May be effected in two ways:

1. Like the starch bandage, being cut open by Seutin's scissors or a strong scalpel.

2. Removing the transverse strips under continual use of water, in order to precipitate the dust formed by it.

Various Modes of Preparing a Good Gypsum Solution, to Delay its Hardening, and to make the Gypsum Bandage easy and elastic.

The gypsum solution hardens in five or ten minutes, according to the quantity of water used for it. In order to apply properly the gypsum bandage a quarter of an hour is required. In fracture of the neck of the thigh, and in all greater bandages, the lower layer of the strips often hardens, while the upper ones are not yet applied; the lower layer, therefore, does not stick to the upper one, the bandage does not become firm, and breaks easily, it is therefore necessary to delay the hardening of the bandage, which is accomplished by adding *glue* to the gypsum solution. The smallest quantity of dissolved glue delays already two or three times the duration of its becoming hardened. Half a teaspoonful of glue dissolved in hot water, and of the consistency to remain fluid, when cold, added to two pounds of water and two pounds of plaster paris, is sufficient to delay the hardening of it for a quarter of an hour; but the glue must not be mixed with the gypsum solution, but always with the water, previous to adding the plaster of paris to it. If added to the gypsum solution it becomes crumby. The thicker the glue, the less of it is required for delaying the hardening of the gypsum solution. If too much of it is added, it does not harden for days. The gypsum solution be-

comes firmer through the addition of *glue*, but the surface remains moist for a longer time. Starch and dextrine exert the same influence on the gypsum solution. Thus prepared, no haste is needed; the bandage is cautiously placed under the limb without lifting up the patient; and changes are made on the bandage at pleasure.

In order to prepare a light bandage, it is necessary to take instead of the coarse linen for splints, *thin, not polished pasteboard;* and for transverse strips, *fine* linen left unpainted on one side of the limb, corresponding with the interspace of the splints. In order to leave on the linen unpainted spots, a longitudinal space, finger wide, may be brushed over with fat or a mixture of soap solution and oil. The sack-linen strips are immersed in the gypsum solution, which does not adhere to the spots covered with the above mixture, and may be easily freed from the gypsum solution by the fingers.

The gypsum bandage may be made more *elastic:*

1st. By applying the transverse strips in figure 8 turns in the neighborhood of joints, and at least two layers.

2d. In the bend of the joints, pasteboard or paper immersed in the gypsum solution must be placed between the linen layers.

If the bandage is applied with interspaces between the splints, and if portions of the transverse strips are left free from the solution, it becomes so elastic as to allow the margins of the bandage, when cut open, to recede from each other so far as to permit comfortably taking the thickest out of the bandage limb and returning it again. The same bandage may be applied two or three times, if cut open and provided with new transverse strips.

Instead of the transverse strips, leather *belts* with buckles may also be used, or dry rollers.

The elasticity depends upon the linen.

The more elastic and finer the linen is, the more elastic is also the bandage; therefore old linen answers better this purpose than the coarse sack-linen.

4. It depends upon the manner of conserving the bandages removed from the limb, and the formation of *cases* and straps for the transportation of the wounded from fractures

A bandage removed from the limb breaks into pieces and makes dust, which may be obviated by various means.

The cases (or capsules) made by those means, together with the leather and boxes for the extremities (of various sizes) not only well answer the purpose of transporting the wounded soldier, but have also a good aspect, are light, are not easily soiled, and attract no moisture.

It is required:

To apply the bandage with openings and longitudinal interspaces.

If very light, fine, and elastic bandages should be made, it is necessary to take, instead of the coarse linen for splints, unpolished pasteboard, common paper, or firm, worn hospital linen, and fine linen for the transverse strips.

In order to make the walls of the bandage still thinner and easier, the limb may be placed in a stocking cut open, and over it a layer of Scultet's bandages, *only the outside* is then covered with gypsum solution to which *glue* was added.

On the sides and the back splints, dipped into gypsum solution (of pasteboard, paper, or linen,) are applied. In front a longitudinal interspace is left (finger wide), and the splints are fastened at first only by thread, and subsequently by transverse strips of fine linen, that also has uncovered portions corresponding to the interspaces. When the bandage becomes *entirely dry* on the limb, it is cut open by scissors along the interspace between the splints and all unpainted and oiled linen flaps are removed on the margins thus gained. The *inside* of the capsule is now lined with linen or oiled silk, and cushioned by filling the hollows with wadding, while the outside is painted over with oil or dextrine solved in water. In order that the bandage be externally waterproof and smooth, and have a good appearance, it may be painted over with common paint as used for walls. Such a bandage (capsule) is yet more elastic than a starch bandage, and is very light, a bandage for the leg weighing but two pounds. For complicated fractures, capsules with windows and wooden splints may be prepared in the same way.

Such capsules, made (for the army and hospitals,) of different sizes, are preferable to the starch bandage, being firmer, not so

easily used up, and not ruined by moisture. The capsules may be fixed to the limb with rollers, leather straps and buckles, or with transverse strips.

In order to prepare a good gypsum solution, it is necessary to know :

1st. That equal parts (in weight) of water and gypsum form a mixture that *thickens in three minutes* and becomes *hard in eight*. Linen dipped in such a mixture becomes firm after twelve minutes, although its surface remains moist for seventeen hours longer.

2d. Two pounds of water, with half a teaspoonful of thickly-boiled glue, mixed, and also with two pounds of gypsum, give a mixture thickening in eight minutes, and hardening in twelve minutes. Sack-linen dipped in this mixture becomes firm after half an hour, the surface remaining moist for all the day.

3. Two pounds of water, with half a teaspoonful of glue, and two and a quarter pounds of gypsum mixed, become thick after six minutes, and firm after twelve; sack-linen fourteen minutes.

The thickening of the gypsum solution does not prevent the application of the bandage. If no glue is added, the solution retains its capacity of sticking for five or six minutes longer, and for twelve or seventeen, if glue was mixed with it.

For the preparation of gypsum bandages are required :

	Water. lbs.	Gypsum. lbs.
For fractures of the forearm, - - -	3	3
" " upper arm and leg, -	4—4½	4—4½
" " neck of the humerus, about -	6	6
" " clavicle and ribs, - -	4—6	4—6
" " thigh, - - - -	7	7
" " neck of the thigh, -	8	8

If common gypsum solution is taken for the bandage, it is better in fractures, the bandaging of which takes more than five minutes, to prepare first only the half of the necessary gypsum solution. But if *glue* is added, the whole quantity may be prepared at once. In order not to lose time in the application of the gypsum bandage in hospitals and on the battle-field, there must be kept in readiness for every kind of fracture a certain quantity of old linen in the form of stockings, sleeves, drawers, then transverse strips and splints of coarse

linen—all these articles must be ready in packages—as you see it here. The manipulation, as you observe, is by such an arrangement facilitated, and much time gained, which on the battle-field is of the greatest consequence.

Bandages for Fractures of the Forearm.

	Long. Inches.	Wide. Inches.
1. *A stocking or half a sleeve.*		
2. *Two* splints of *sack-linen* folded twice or thrice, -	11	3
3. *Six transverse strips of sack-linen*, three in each layer, surrounding the limb once and again halfways, -	10	3

For Fractures of the Humerus.

1. A cut open shirt sleeve.
2. Two side splints.
   (*a*) The external back splint, 20 { In the lower end near the hand 3 inches; near the shoulder 5 inches.
   (*b*) The internal front splint, 18 {
3. Transverse strips, six in each layer :
   For the forearm, - - - 9 {
   For the humerus and elbow, - 12—13 { 4 inches.

For Fractures of the Neck of the Humerus.

	Yds.	Ins.
1. A sleeve and an upper part of a shirt or of a jacket of linen.		
2. Splints and strips, as in fracture of the upper arm.		
3. A broad belt for the trunk, - - - -	3	7
4. Three transverse strips, - - -	2½	3

For Fractures of the Thigh.

	Inches.	
1. A cut-open stocking.		
2. Two splints of sack-linen, - - - -	18	5
3. Ten transverse strips, five in each layer :		
Below, for the foot joint, - - -	12	3
Above, near the leg, - - - -	16	
4. One or three transverse strips for the foot, -	10	3

For Fractures of the Patella.

	Yds.	Ins.
1. A divided pair of drawers, the half cut open.		
2. A splint of sack-linen for the back of the limb, -	1¾	7
3. Sixteen transverse strips, eight in each layer :	Ins.	
For the lower part of the leg, - -	12	4
For the knee, - - - - -	13	
For the thigh, - - - - -	20	
4. Thick wire for fastening the leg.		

For Fractures of the Thigh and its Neck.

	Long. Yds.	Wide. Ins.
1. A divided pair of drawers cut open.		
2. Two splints of sack-linen, three folds thick.		
An outer splint,	2	
For the upper part,		10
In the middle,		7
Below,		4
An inner splint,	1¾	
Above,		7
Below,		4
3. Sixteen or eighteen transverse strips, eight or nine in each layer:	Ins.	
Below—For the foot joint,	12	4
For the knee,	16	
	Yds.	
Thigh and inguinal region,	1¾	
4. Two strips for the eight turns on the foot joint,	1¼	3
5. Roller for the pelvis,	2	6
6. Two or three strips for the pelvis (spica),	4	4

I have thus, Gentlemen, *practically* demonstrated to you the various manipulations necessary for the application of the different bandages, with their numerous modifications, leaving to your own judgment to choose, when called upon, the most appropriate and suitable one that will be suggested to you by the peculiarity of the injury in the wounded soldier, and by the circumstances of war.

PART II.—REVIEWS AND BIBLIOGRAPHY.

"Nullius addictus jurare in verba magistri.

Memoirs of Daniel Drake, M.D. By E. D. MANSFIELD, Author of "American Education," &c.

This volume has just been issued from the press of Messrs. Applegate & Co., Cincinnati, and is a valuable contribution to historic medicine. It is replete with interest, and gives a clearer insight into medical politics of this latitude than any other book extant. Nor is this all. The subject of the "Memoirs," having by his labors and genius identified himself with all the important social, political and scientific movements of his day, and especially those connected with

and growing out of his profession, the biography of Dr. Daniel Drake, becomes a current history of the times, and a *mirror*, from which features—though occasionally distorted—of the profession of medicine are reflected, from its infancy in the West, up to the present.

By nature he was designed for primitive work, and was endowed with the attributes of a great general, whose will, for the security of the fortress, was necessary to be *universal law*. Insubordination to his wishes and commands, was inconsistent with the harmony of the forces; and when persisted in, was tantamount to insurrection. He was jealous of his rights, real and imaginary, and resisted, with animosity peculiar to him alone, any encroachments upon them. This will account for the many bitter professional and social controversies which from time to time marred his otherwise brilliant career, and rendered a part of his existence acerbate and less profitable than it otherwise would have been. The latter half of his life he lived in advance of the present age, and his genius then shone without a stain to tarnish its brilliant lustre, while alone upon the stage, he made battle with the *arcana* of nature, and brought back from the contest principles and truths which will survive the "wreck of ages."

In entering upon the active duties of life, he found the arts and sciences, commerce, social and political economy, in their infancy, and with the hand of a foster-mother, he contributed to their development, and imparted to each the impress of his own inherent greatness. For more than half a century no important movement was permitted to pass uninvestigated; his time and talents appeared adequate to them all. To him, more than any one citizen, Cincinnati—and perhaps the West, are indebted for the social, scientific and commercial prominence which they now enjoy.

The life and character of Dr. Drake, are just sources of pride and emulation to every intelligent physician of the Mississippi Valley. They illustrate the achievements capable of being accomplished, unassisted by knowledge obtained from schools. To those just entering upon the duties of forming for themselves a character--and especially the physician--his untiring labors should be constantly imitated, and the noble results ever kept in view, as incentives to the great work.

Having his profession determined for him by his father, young Drake received the advantage of an extra "quarter of country school ing," over his brothers and young associates. When he entered the office of Dr. Goforth, at Cincinnati, as a student of medicine, according to his own account, his stock of book knowledge consisted in

the following inventory, viz.: I had learned to spell all the words in Dilworth, a good portion of those in Noah Webster, jr., whose spelling book then seemed to me a greater marvel than does his quarto dictionary now lying before me. As a reader I was equal to any in what I regarded as the highest perfection, a loud and tuneless voice. In chirography I was *so so;* in geography, I was obscure; in history, O—! In arithmetic, as far as the double rule of three, interest, practice, tare and tret, and even fractions in decimals. My greatest acquirement, that of which I felt rather proud, was some knowledge of surveying, acquired from love—I mean to name my author as well as my taste, but which I have long since forgotten. Of grammar, I knew nothing, and unfortunately, there was no one within my reach who could teach it.

But let no one be deceived, or deluded with the idea, that Dr. Drake remained long in this unfortunate condition. A part of each day was devoted to the cultivation of literary and scientific studies, outside the pale of his profession, and he soon becomes a MASTER, organized a "College of Teachers," and shines among the literati and savans of his age.

The great want of thorough mental culture, proved almost an insurmountable barrier to his early scientific pursuits; and notwithstanding he even became familliar with the classics, his defective mental training during his youth was ever deplored by him. Feeling personally the great embarrassments under which young men are placed, when ushered into the profession of medicine with defective preliminary education, he was ever found the firm advocate of thorough mental discipline, and a high order of preliminary acquirements for those who seek the "honors and immunities" of the profession of medicine. If the standard of elementary and professional acquirements, contended for by Dr. Drake, were exacted from those seeking the *doctorate*, with ordinary faithfulness, the profession would soon be divested of ignorant pretenders and bungling physicians.

Fifty-five years ago from the present writing, Daniel Drake commenced the study of his profession, and was the first medical student of which Cincinnati can boast. His first duties were "to read Quincy's Dispensatory and grind quicksilver into mercurial ointment. This was the beginning of theory and practice at once. The medical books studied were Chesselden on the bones and Jones on the muscles, without specimens of the former or plates of the latter; and afterwards the humeral pathology of Boerhaave and Vansweiten, with-

out having studied the chemistry of Chaptal, the physiology of Haller or the materia medica of Cullen."

After practising a year with his preceptor,—as is occasionally the custom now-a-days, in 1805 Dr. Drake entered the University of Pennsylvania, at Philadelphia. The faculty was then composed of Rush, Woodhouse, Wistar, Physic, Barton and Dewees. During this course, he took but the tickets of the four former, for lack of funds to meet the current expenses of the winter. They, in the aggregate cost him $70,00; that of Dr. Physic, being $10 00; the others $20 00 each. This, with another significant fact, which occurred eleven years subsequent, demonstrate quite conclusively, that the venerable and distinguished, when composing this faculty, guarded with scrupulous care the portals of the profession. After attending his first course of lectures he returned to Cincinnati, and soon took the lead in the practice of his profession. He applied himself closely to scientific and literary pursuits, and become an author of some distinction. Ten years after his first visit to Philadelphia, he returned to obtain a degree from the University, and at the conclusion of the lectures he found the commencement over, and was, moreover, *threatened* with the loss of his diploma, which had been the great object of his visit to Philadelphia. The faculty, however, granted him a separate "commencement," and he received the first medical degree which was ever conferred upon a citizen of Cincinnati. As he had been the first medical student, so he was now the first graduate of medicine of this new city."

In the Spring of 1816, he recommenced the practice in his native city, continuing to lead the scientific and literary circles of the place. The next year "ushered him into a new, and after a time, the most important public relations of his life. In January of that year he accepted a professorship in the Medical College at Lexington, and soon after commenced his long and distinguished career as a public teacher of medicine. This event he announces to an old and intimate friend with evident satisfaction. "I am now going to astonish you—so cling hold to every support within your reach—*I am a Professor!* Yes, incredible as it may appear, *I* am really and *bona fide* appointed a professor, and I repeat it on this side of the sheet, to save you the trouble of turning back to see if your eyes did not deceive you. I am, let me repeat, unquestionably a professor; but you must not suppose by this that I am a great man. For a professorship, to confer greatness, must be a professorship in a great institution. But this does not happen to be the case in this instance. This was the

commencement of the Transylvania University, the first Medical College West of the Alleghania range of mountains, and owes its origin to the exertions of the immortal Dr. Benjamin W. Dudley ; a man, whose reputation, long since, has become world-wide.

To Dr. Drake, a connection with this Institution was the commencement of a career full of thrilling events, which are recorded in a happy manner by his biographer. "He frequently said in after time, that if there was anything he had a strong taste and peculiar qualification for, *it was that of teaching medicine.* He was ambitious of being a successful and popular teacher ; and in addition to the united testimony of a host of admiring physicians scattered over the South and West, who at some time during their lives were students of his ; the evidence furnished by Dr. Gross, who for many years was associated with him in imparting medical knowledge from the *rostrum*, will demonstrate that in this particular, he beame eminently successfull.*

"It was here, surrounded by his pupils, that he displayed his powers with peculiar force and emphasis. As he spoke to them, from day to day, respecting the great truths of medical doctrine and medical science, he produced an effect upon his disciples such as few are capable of creating. His words dropped hot and burning from his lips, as the lava falls from the burning crater ; enkindling the fire of enthusiasm in his pupils, and carrying them away in total forgetfulness of everything save the all-absorbing topic under discussion. They will never forget the ardor and animation which he infused into his discourses, however dry and uninviting the subject ; how he enchained their attention, and how by his skill and address, he lightened the tedium of the class-room. No teacher ever knew better how to enliven his auditors, at one time with brilliant bursts of eloquence, at another with glowing sallies of wit ; now with a startling pun, and anon with the recital of an apt and amusing anecdote, eliciting, on the one hand, an admiration for his varied intellectual riches, and, on the other, their respect and veneration for his extraordinary abilities as an expounder of the great fundamental principles of medical science. His gestures never graceful, and sometimes eminently awkward, the peculiar incurvation of his body, nay, the very *drawl* in which he gave utterance to his ideas, all denoted the burning fire within, and seemed to impart force and vigor to everything which he uttered from the rostrum. Of all the medical teachers whom I

* Discourse on the life, character, and services of Daniel Drake, M.D., by S D. Gross, Louisville, 1853.

have ever heard, he was the most forcible and eloquent. His voice was remarkably clear and distinct, and so powerful, that when the windows of his lecture-room were open, it could be heard for a great distance. He sometimes read his discourses, but generally he entered the rostrum without note or scrip.

"His earnest manner often reminded me of that of an old and venerable Methodist preacher, whose ministrations I was wont to attend in my early boyhood. In addressing the Throne of Grace, he seemed always wrestling with the Lord for a blessing upon his people, and, in a way so ardent and zealous, as to inspire the idea that he was determined to obtain what he asked. The same kind of fervor was apparent in our friend. In his lectures he seemod always to be wrestling with his subject, viewing it and exhibiting it in every possible aspect and relation, and never stopping until, like an ingenious and dexterous anatomist, he divested it, by means of his mental scalpel, of all extraneous matter, and placed it, nude and life-like, before the minds of his pupils."

Then as now it was found unprofitable for a physician to leave a lucrative practice for one-fourth of the year, to deliver a course of medical lectures in an institution removed from the theatre of his private professional labors. Satisfied with his own ability to teach, Dr. Drake, at the termination of his first course of lectures, returned to Cincinnati—then numbering 10,000 inhabitants, with the full determination of taking immediately, the initiatory of establishing a medical school in his own city.

Through instrtumentalities conceded to him, during the coming year, the Lancaster Seminary and Worcester Museum were endowed, by the munificence of liberal citizens and ardent friends, which Dr. Drake had gathered around him. Also, a suitable site for a "poor-house was purchased, and the establishment planned in a manner that would make it an hospital." Soon after, he, in conjunction with Drs. Coleman, Rodgers and Black, the latter being Principal of the Lancaster Seminary, commenced medical lectures to a class of twelve students. "These energetic measures excited a strong sensation at Lexington, among his former colleagues, and to prevent the establishment of a rival school at Cincinnati, Dr. Drake was offered the first professorship in Transylvania, if he would remove to Lexington permanently. This he declined; for he already clearly saw the future magnitude and prosperity of Cincinnati, and was unwilling to remove from a rising town to one upon which the shades were already falling."

Having abandoned all idea of renewing his connection with the School at Lexington, in the winter of 1818–19 he proceeded personally to Columbus to obtain charters for a Medical College and Hospital. His views and plans were adopted by the Legislature, then in Session, and charters for Cincinnati College—to be formed out of the Lancaster Seminary, Medical College of Ohio, and Commercial Hospital—to be connected with the Medical College, were granted, Nor was he satisfied with simple charters, but obtained an endowment, sufficient to put them all in successful operation.

In organizing the faculty of the Ohio Medical College, unforseen difficulties were encountered by the projector. The intrigues of professional rivals delayed the opening of the school until the Winter of 1821–22. According to the law, the faculty was empowered to conduct all the affairs of the Institution. This unlimited power was another intrinsic source of disturbance. The faculty controlled its members ; and opposition to Dr. Drake had so far gained the ascendancy, that after the first course of lectures, he was expelled from the Institution which he had legitimately erected. He was President of the faculty, and conducted the deliberations of the meeting at which he was dismissed. A motion was made and seconded, to expel him from the faculty ; Dr. Drake put the question, it was carried in the affirmative, and he *indignantly* bowed himself out of the meeting. This act is perhaps unprecedented in parliamentary proceedings.

Dr. Drake drafted the charter and organic law for the Medical College, as well as that pertaining to the Hospital. In conferring upon the faculty the power of appointing and removing its members he doubtless designed to give himself personal control of the affairs of the Institution, and decide who should be its professors. This radical movement not only wrought a temporary destruction of the object for which he labored so assiduously, but proved the greatest source of disappointment of his life. With the separation of Dr. Drake from the College, may be dated the first era of this Institution, whose history is written in two words—*reform, mutation.* There was not enough vitality in the Ohio College, as then organized, to survive the shock which the expulsion of Dr. Drake created. The next course of lectures was an *abortion.* After several years of inactivity, the friends of the Ohio Medical College reörganized the faculty, and placed the government upon more liberal grounds, and under the control of trustees.

After lecturing three sessions in Transylvania and one in Jefferson, at Philadelphia, with marked success and satisfaction to his different

classes and colleagues, he returns to the chosen theatre of his early love—establishes the Western Journal of Medical Sciences, conducts into successful operation, by the aid of wealthy and philanthropic friends, an Eye Infirmary, and in 1831, organizes a Medical Department to the Miami University. Drs. John Eberle, George McClellan, James M. Staughten, J. F. Henry, J. N. McDowell, Thomas D. Mitchell, and Daniel Drake, composed the members of this new faculty. At that time, most of these men were just commencing their career of usefulness. A great majority found themselves to be men for the times, and have left an imperishable memory; while others are still building lasting monuments to their names. Could this faculty have been kept together, the highest aspirations of its projector would doubtless have been realized.

"At this juncture, the faculty and friends of the Medical College of Ohio, judging that the new school would probably destroy the old one, took measures to effect a compromise and union between the two. The result was, that the scheme of the Miami School was abandoned, and Drs. Eberle, Staughten and Mitchell, accepted places in the old school. A professorship was also erected for Dr. Drake, but being evidently a supplement to the ordinary chairs, he resigned at the end of the session of 1831–32, and again returned to private life."

It was next to impossible for Dr. Drake to abandon the idea of making Cincinnati the "Medical Emporium of the West." To accomplish this, his every effort had signally failed. The Ohio Medical College, at this time, "had few students and less reputation." During the sixteen years of its existence, 1,019 students had matriculated, many of whom were beneficiaries under the charter. All hopes of reformation in this Institution, appeared to him futile. "The Legislature had instituted a solemn inquiry into its proceedings—had enlarged the board and elected new trustees—but all in vain! * * * In the Winter of 1834–5, another petition, numerously signed, was sent up to the Legislature for reform. Among them were Dr. Joshua Martin, of Xenia, Dr. Stale, of Dayton, Dr. Olds, of Circleville, and Drs. Richards, Rives, Judkin, Mount, and numerous other physicians of Cincinnati." The subject was referred to a committee, who reported that the "dissensions of the individuals composing the faculty at different times, and the want of scientific reputation in the teachers," were the origin of the difficulties and want of success. The trustees again attempted reform, and offered Dr. Drake and two of his professional friends, positions in the school; at the same time,

retaining the remainder of the old faculty, "of whom one or two were those most defective, and against whom most complaint had been made." With these Dr. Drake refused to coöperate, and the scheme of half-and-half again failed."

Under these circumstances, the friends of Dr. Drake determined to revive the Cincinnati College, which was done in 1836, by electing the following gentlemen to fill the various chairs of the Institution, viz.: Drs. J. M. McDowell, Lamb, D. Gross, Landon C. Rives, B. Rodgers, John P. Harrisson, Daniel Drake and Willard Parker, Here we again find Dr. Drake associated with another faculty of men, who, in subsequent years, have, without exception, distinguished themselves in some department of medicine. Some have attained the first position in the American profession. Notwithstanding the comparative success which attended the labors of this organization, at the end of the fourth year of its existence, its friends and founders were doomed to witness its dissolution, and it has never since been reëstablished.

Thwarted again in the cherished purposes of his heart, in building up a great medical school in Cincinnati, from 1840 to 1850, we find him lecturing to large classes of medical students in the Medical Institute at Louisville. The trustees of this school, having limited professorships to those under sixty-five years of age, as he approached this period, Dr. Drake resigned his position, and was immediately elected to fill the chair of Theory and Practice in the Ohio Medical College. "The circumstances which formerly existed as to the professors had changed. The old asperities and controversies had passed away, and with none more entirely and completely than him. He had forgiven, and had resolved to forget whatever had intervened between him and peace with his fellow-man. He therefore accepted the chair offered him, and for one Session lectured for the last time within the walls of the Ohio Medical College."

In his Introductory to this Course, after alluding to his connection with Cincinnati and various Medical Institutions, he said: "My heart still turned to my first love, your alma mater. Her image glowing in the warm radiant tints of early life was ever in my view. Transylvania had been reörganized in 1819, and included in its faculty Professor Dudly, whose surgical fame had already spread throughout the West, and that paragon of labor and perseverance, Professor Caldwell, now a veteran octogenarian. In the year after my separation from this school I was recalled to that; but neither the eloquence of colleagues, nor the greeting of the largest classes

which the University ever enjoyed, could drive that beautiful image from my mind. After four Sessions I resigned, and was subsequently called to Jefferson Medical College, Philadelphia, but the image mingled with my shadow; and when we reached the summit of the mountain, it bade me stop and gaze upon the silvery cloud which hung over the place where you are now assembled. Afterwards, in the Medical Department of the Cincinnati College, I lectured with men of power to young men thirsting for knowledge, but the image still hovered around me. I was then invited to Louisville, became a member of one of the ablest faculties ever assembled in the West, and saw the halls of the University rapidly filled; but when I looked upon the faces of four hundred students, behold! the image was there in their midst. While there, I prosecuted an extensive course of personal inquiry into the cause and cure of the disease of the interior of the Continent; and in journeyings by night—on the water and on the land—while struggling through the matted rushes where the Mississippi mingles with the Gulf—or camping with the Indians or Canadian boatmen under the pines and birches of Lake Superior—the image was still my faithful companion, and whispered sweet words of encouragement and hope. I bided my time, and after twice doubling the period through, which Jacob awaited for his Rachel, the united voices of the trustees and profession, has recalled me to the chair which I held in the beginning."

What a graphic description of the *image* which floated through his mind and attended his wanderings through a third of a century "In times of disappointment, he attempted to throw it aside. He had labored in Lexington, Philadelphia, and Louisville, under circumstances which would have allured almost any one, and brilliant prospects which would have tempted almost any ambition. But, from every point of the horizon, wherever drawn, his mind constantly returned to this home of his affections, and his eyes lingered upon the beautiful image which floated through the vision of his fancy."

This brief and cursory view of the "Memoirs" of Dr. Daniel Drake exhibits his character and labors only as they have been connected with the teaching of medicine, a subject which ever rested near his heart, and warmed into enthusiasm the strongest passions of his ardent nature. In it there is much that is worthy of admiration, and arouses genial sympathies for the departed *savant*. Sustaining a near personal relation to the subject, the author of the book, while he recorded the acts of a truly great man, colors the pictures with the pencil of a partisan. The fact cannot be gainsayed, that Dr.

Drake was designed to *rule* in every enterprise in which he embarked. This is palpable from many circumstances, none of which, however, exhibits it in a stronger light than the proscriptive charters of the "Ohio Medical College" and Commercial Hospital, who trace their parentage to his pen. Endowed with a liberality and munificence unsurpassed by any similar institutions in the country, and surrounded by circumstances and facilities unequalled in the Mississippi Valley for teaching medicine, the organic defects which they inherited, *crippled their youth, impaired the vigor of their manhood, and brought on premature decrepitude.* Like idiosyncracies and transmitted taints, the elementary defects which these institutions received at the hands of their author, has followed them through their entire lives, and will probably terminate their existence. "Reform," like hyper-medication, has been administered until it, in turn, has almost amounted to a disease. Had this College and its Associated Hospital been conducted upon a scale of liberality, commensurate with the demands of the profession, instead of struggling out its existence in opposition to two rival schools in Cincinnati, with an average attendance of from thirty-five to sixty matriculants, it might have been to the West what the foremost institution in this country is to the East.

It is but human nature, after being entrapped in the snare which he designed to wield against others, that whatever of influence—and it was mighty—that Dr. Drake might be capable of wielding against the Ohio Medical College, or the interests of those engaged in its service, would be made to tell in the most diversified and potential manner; and he was true to human instincts. Herein is the nucleus from which sprung the whole difficulties of his life.

In attempting to explain some professional controversies in which he was involved during his early career, Dr. Drake advanced the following theory to account for his difficulties, viz.:—That it was the only profession which had no ultimate tribunal for the settlement of controversies. Clergymen, in all denominations, have some ecclesiastical tribunal; lawyers have their courts; merchants their chamber of commerce; mechanics their professional societies; but doctors had no ultimate tribunals—neither courts, nor assemblies, nor boards of ultimate authority. The consequence is that they continually appeal, in their difficulties, to the public; and this involves at once personalities, recriminations, charges, and misrepresentations, each of which stands upon no other authority than the persons themselves, and each of which is believed or disbelieved by different portions of the community. The result is that medical quarrels are numerous, and occasion no small acerbity and ill-will in society.

But whatever Dr. Drake's imperfections may have been, his labors for the cause of science and humanity are unsurpassed by those of any other one individual of his age. He has more than distanced all his rivals, and erected a monument to his name which is imperishable. For extent of original labor, literary and scientific merit, his great work on the Interior Valley of North America and its diseases is unsurpassed in any language. It is a treatise of which every American may especially be proud. This was the elaborate result of his entire life. Commenced early in his professional career as a notice of his native city and its local affections, it expanded into a history of the Continent. No man was more familiar with the physical condition of this country than Dr. Drake. Every important feature of it had at some time during his life been the subject of his personal scrutiny. The results of his observations he has recorded in a most felicitous manner, for the benefit of the present and future generations.

H. G. C.

Dayton, O.

A Practical Treatise on the Diseases of the Eye. By WILLIAM MACKENZIE, M. D., to which is prefixed an Anatomical Introduction, explanatory of a horizontal section of the human Eyeball. By THOMAS WHARTON, F.R.S., with 175 illustrations from the four revised and enlarged London editions—with notes and additions. By ADDINELL HEWSON, A.M., M.D., one of the Surgeons to Wills' Hospital, &c. Philadelphia: Blanchard & Lea. 1855.

From childhood opposed to heavy books, restricting by their bulk more or less locomotion, and change of attitude required in continued study, we strongly object to the aspect of the large volume before us, horrified by the sameness of position it implies while necessarily laid down when perused. The title contains two good names, William MacKenzie, M.D., and Wharton Jones, F.R.S., with notes and additions of a third, Addinell Hewson, A.M., M.D. The former two require no introduction, familiar as they are to the profession at large, their products taken altogether are the more valuable, as they include carefully made compilations of foreign literature, well representing foreign ophthalmic medicine and surgery. Their books are desirable to the practitioner, necessary to the student, and essential to the ophthalmic surgeon.

The volume of 1027 pages, not being merely an occasionally to be consulted *repertoir*, but a hand-book to be studied, might have been preferable, and more acceptable to the reader, if divided in two parts.

The omission of Dr. Hewson's additional notes, would scarcely have rendered this standard book less valuable, containing as the notes do, besides an imperfect "short account of the ophthalmoscope," compilations of little value, and advertisements of an instrument-maker in Philadelphia. We are somewhat at a loss to account for the publication of a work, of itself practical and instructive, with notes and additions so strongly contrasting in character and value. While Hays* gave his observations, gained in his extensive practice, and coupled with them the experience of other eminent surgeons, thus affirming modifying assertions and practical remarks, or often politely contradicting statements of others, conceived by him to be erroneous on the evidence of such convictions as based on practical ground, and repeatedly furnished in his longstanding practice—Hewson, has no idea of his own. Whether modesty dictated by want of sufficient practice in ophthalmic medicine and surgery, or the assurance of the insignificance of his additions, made him note little, we are not prepared to say; but we must confess the additional notes look to us, like an after-dinner execution of a morning's thought—the idea of editing with additions is a bright one, but carried out with a loaded stomach. Our transatlantic brethren must smile over the introduction by notes, which their standard works need in this country to meet the eyes of the profession. If our American publishers are over anxious to afford us the benefit of foreign literature, why do they not rather encourage translations from foreign languages into English, and make thus accessible to a great portion of the medical community, that which remains unknown to us for such a long period of time. But we understand the books published abroad are mostly property of the publisher, who generally buys the manuscript, while here the *soi disant* editor runs the risk, if unknown, and thus pays for the association of his name with that of authors of fame, instead of achieving this honor by exertions and literary labor. To return to Dr. Addinell Hewson, for whom we had to hunt over dozens of pages, till we could find a resting point or brackets, we consider his ambition for editing a tendency in the right direction, but the realization of this tendency would have produced better effect, if his notes with additions came by way

* Lawrence.

of a journal, as a modest contribution suitably connected, the notes and additions not outnumbering twelve pages. We confidently hope that Dr. Hewson will forgive our friendly suggestion for imitating Dr. I. Hays. When equal to him in experience, then his information may be beneficial to the profession, and will be supported and applauded by the press.

Transactions of the American Medical Association. Vol. 8, 1855.

We desire to record the fact very legibly that this volume is received, it having reached us on the 17th day of November. No time is now afforded for even a bibliographic notice.

PART VI.—EDITORIAL AND MISCELLANEOUS.

SECOND EDITION—FIRE.—Subscribers are informed that the delay this month is caused by the destruction of the whole of our first edition by fire, just as it was ready to deliver, compelling an entire reprint. We shall still hope to be able to distribute the January number early in the month, and meantime suggest to those who owe us, to forward their amounts due; and to all who are not so, at once to become Subscribers to the MONTHLY.

WHERE IS THE AMERICAN MISS NIGHTINGALE?—The *Observer* gives the following sketch of "Scenes in a Hospital" in this country. Miss Nightingale is wanted here, as well as in Scutari or Sebastopol:—

Having recently visited the largest Hospitals in Europe, and marked the order, quiet, decorum, devotion of nurses and physicians, the perfection of the details for the improvement and comfort of the patients, we were disposed to look into the state of things in an American Hospital, which we were suddenly summoned to, a few days ago. We do not say what Hospital it is. It is doubtless as

well managed as any similar institution in this country. Its buildings are vast, costly, admirably arranged, appointed, and furnished with every necessary apparatus. In point of situation, ventilation, furniture and grounds, it is superior to any we saw in Europe. And here all praise ends.

At the entrance we inquired for the patient whom we desired to see. He had been brought in badly hurt, a few hours before. The answer from the man in the office at the right of the open door, was briefly: "Go up stairs to No. 10, and the doctor will tell you where to find him."

We went up stairs, and after inquiring of one or two in the hall, found the room, where several men were engaged in dressing the wounds of a man. As no one of them looked like *the* doctor, we addressed the inquiry generally to the group. A youth sitting by in an arm-chair, and apparently having nothing to do with the case in hand, who proved to be *the* doctor in question, replied: "In the South building, No. 6, you will find the patient"

"Is he very badly hurt?"

"Yes, there isn't the slightest chance of his getting through."

We left the room, and soon found the labyrinth of halls perfectly unintelligible, and the points of compass equally so. We returned to the room, and the doctor was kind enough to say that he would show us the way.

In a large and well-arranged room, in a row of wounded men, lay the one I was looking for. His injuries had been dressed, but he was very feeble, and I was soon convinced that he would not live. After I had been with him half an hour, he wanted some water. A stool between his cot and the next, contained medicines and drinks for both, a slight partition separating the two. Both patients could readily reach them, and help themselves. Even the brandy, which was to be administered in small quantities, at certain intervals, was there, and the patient could take it at any time, and in his thirst or impatence, or delirium, he might have swallowed everything designed for him and his neighbor. This neighbor cautioned him against touching the medicines, lest he should take something wrong. A coarse Irishman, the nurse, now came along, and I said to him that he wanted a drink of water. "Well he can't have it; he's a taking brandy, and it won't do for him." Of course I submitted, but the kind-hearted neighbor in suffering, said:

"He's faint, and a drop of water will revive him."

The raw Irisher turned upon him and exclaimed, "you shut up your head, will you."

All the while I had been sitting here, a rattling noise from a room, the open door of which led immediately from this, had annoyed me much, and I had felt that it must be harrowing to the distracted nerves of these men, every one of whom was stretched out with broken or amputated limbs. At length I inquired what it was, and was answered, that the attendants were "*playing dominoes.*" Over a large wooden table they were frequently shuffled, making a startling

and grating noise most painful to the poor fellows, who must endure it for successive hours. The heartless cruelty of this noisy amusement, inflicted by men who are employed and paid to watch with tenderness over their suffering fellow men, excited my indignation, and I freely expressed it on the spot.

There are in this city, and other cities, many females who, for the love of God and man, desire to perform works of mercy, such as the "Sisters of Charity" abound in, and we should be glad to know that a corps of them were ready to take in charge the wards of this Hospital. We will give its name to any person who wishes it for a good object.

What we desire, specially, to exhibit in this statement, is the prevalence of the same spirit that marks American institutions too frequently: an absence of all sense of responsibility on the part of servants and officials: a reckless way of doing things; a want of sober, careful and faithful attention to the duty required, and an utter contempt of all authority. We presume the managers of this Hospital have made regulations, which are violated in the particulars we have pointed out. And we could point out other and *more important deficiencies*, but this would bring a non professional opinion into conflict with the faculty, and would go for nothing. Two hours in this Hospital satisfied us that even in the best regulated establishments, there is a mighty call for reform. IRENÆUS.

Extract from a private letter, from the *Philadelphia Evening Bulletin*, dated English Hospital, Scutari, Monday, Sept. 17, 1855:

"Although this is unquestionably the largest hospital in the world, and, in some respects an excellent school for a young physician, yet I am on the whole somewhat disappointed. Every one in authority has, it is true, been kind and attentive, but there are more patients suffering from fever, cholera, and dysentery, than from wounds, so that there is not the opportunity for surgical practice that I had expected.

The most interesting person here, without doubt, is Miss Nightingale, with whom I have had the good fortune to have several interviews. My first visit was for the purpose of presenting to her a gift from a lady in Philadelphia. She was in a great store-room of this mammoth establishment, dispensing good and useful things to numerous applicants. I found her a tall, slender woman, looking younger than her real age, which is about thirty-three, with light hair, blue eyes, and a very pretty mouth. Ordinarily her expression of countenance is almost melancholy, but when she speaks her face lights up and she becomes very animated and attractive. She is the theme of every one's admiration and praise, both in the hospital and in camp, and every soldier has given most cheerfully his contribution towards the Nightingale Hospital, which is to be erected near London, to commemorate the noble heroism of this self-sacrificing woman."

These two extracts from newspapers, we cut from the same num-

ber of the *Church Journal*, and they present contrasts too true to be flattering to our national pride. To what hospital Mr. Prime, the writer of the first, alludes, we have not asked, but no one will have any difficulty in guessing who is at all familiar with such institutions. It is to be confessed, however, that the same strictures would apply to all the large hospitals in this city, and in every other large city in the country, with not more than one exception, if even that. Now we do not hesitate to say this ought not to be so. Good nurses should be provided, and they should be chiefly women, acting under the direction of women. They should not, however, be a board of lady managers looking in occasionally and formally, but such women as Miss Nightingale, (if there be such in our country, and we are sure there are,) plunging into the whole business, guiding, directing, overseeing; with woman's wisdom avoiding difficulties, with woman's tenderness soothing the anxieties and wanderings of the fevered spirit, or with woman's hands administering the bitter draught, less bitter from the sympathy with which it is given, or the cool water doubly refreshing from the mode in which it is bestowed. There would then be none of the rudeness of which "Irenæus" speaks, nor the indirect extortion of fees from poor relatives, as we have *known* to be done by nurses (probably in this same institution), that the suffering one might receive the commonest attentions. Every physician knows the important difference which little attentions make in the result either for life or death to the very sick; and we doubt not that the introduction of a corps of *well-trained* female nurses, headed by an intelligent, experienced, and energetic *lady*, into our large hospitals, would lessen very materially their mortality. Physicians point with just pride to the heroism of their professional compeers, but can they show greater examples of it than are afforded by Miss Nightingale at Scutari, or Miss Andrews at Norfolk? Let them then encourage every effort to replace stupid, coarse, and unfeeling "Irishmen," by those who can do something besides play at dominoes.

Of the mode in which, and the persons by whom, this change is to be accomplished, we shall seek another opportunity to speak.

Prosecutions for Malpractice.—At Philadelphia, last Spring, Dr. Frank H. Hamilton, of Buffalo, N. Y., in connection with his report on "deformities after fractures," made some remarks upon suits for malpractice, on which subject it is known he is almost classic

authority. Having learned that the reports were somewhat erroneous, we have been at some little pains to obtain a correct statement of them, and the following may be relied on as correct:

Dr. Hamilton said he had a word to say which did not belong to the report. Prosecutions for malpractice have become so frequent that surgeons were alarmed, and not a few were abandoning the profession, or refusing altogether to undertake the treatment of grave surgical accidents, and especially of fractures. So frequent were these occurrences, that members were no longer surprised at such statements. If they had heard the speaker say that lawyers were abandoning the profession from this cause, they would have been startled, but such statements in relation to our profession are familiar, and have ceased to excite surprise.

It is proper for us, then, to interrogate ourselves. Why is it that we are held to an accountability so much more strict than any other professional men, or than any other artizans? Is it because there are jealous and designing men in our own ranks who instigate these suits? No doubt such men may be found, but only as an exception. The fact is that surgeons have sometimes been mulcted in damages simply because the jury believed, from the united character of the medical testimony, that it was a conspiracy, and the more conclusive the testimony, the more certain, with some jurors, is the defendant to suffer.

Is it chargeable to the members of another profession—to the lawyers? There may be some men in the profession of law, also, who, driven by the sheer necessity of their circumstances—by their extreme poverty, or who, without any such apology, with only loose notions of right and wrong, encourage and undertake such suits—such are the men who hang about the tombs in New York, and who may be found, more or less in every town—but the speaker has reason to believe that honorable and intelligent lawyers seldom countenance these prosecutions. That eminent jurist of the State of New York, Joshua Spencer, has told Dr. Hamiltion, for himself he does not think he ever commenced a suit of this character, although he has been frequently retained as counsel, and he believes his brethren, generally, look upon these complaints with suspicion and refuse to meddle with them.

Where, then, must we look for an answer to the question, Why are these prosecutions against surgeons so frequent? Let the gentlemen be assured, the causes are to be found in the *very imperfections of our art, and in our own unwillingness to admit these imperfections.* Surgeons have claimed too much, and it cannot certainly be expected that the world will demand of them less than they claim for themselves. Again and again surgeons have said that a fracture of the femur might be *generally* made to unite without any shortening, while the fact is not so. Malgaigne, who is eminently an honest man, says, to make this bone unite in an adult person, *where the fracture is sufficently oblique to prevent the ends from supporting each other,* is "simply impossible," (*simplement impossible.*)

Let the profession be wiser in future and acknowledge that they cannot perform impossibilities.